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Electrical World

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December 17, 1921

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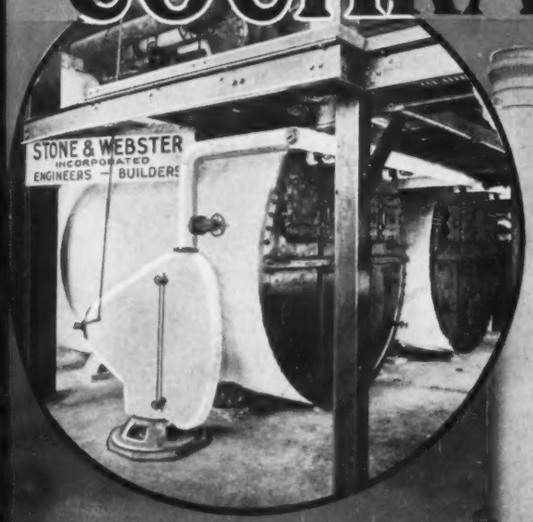

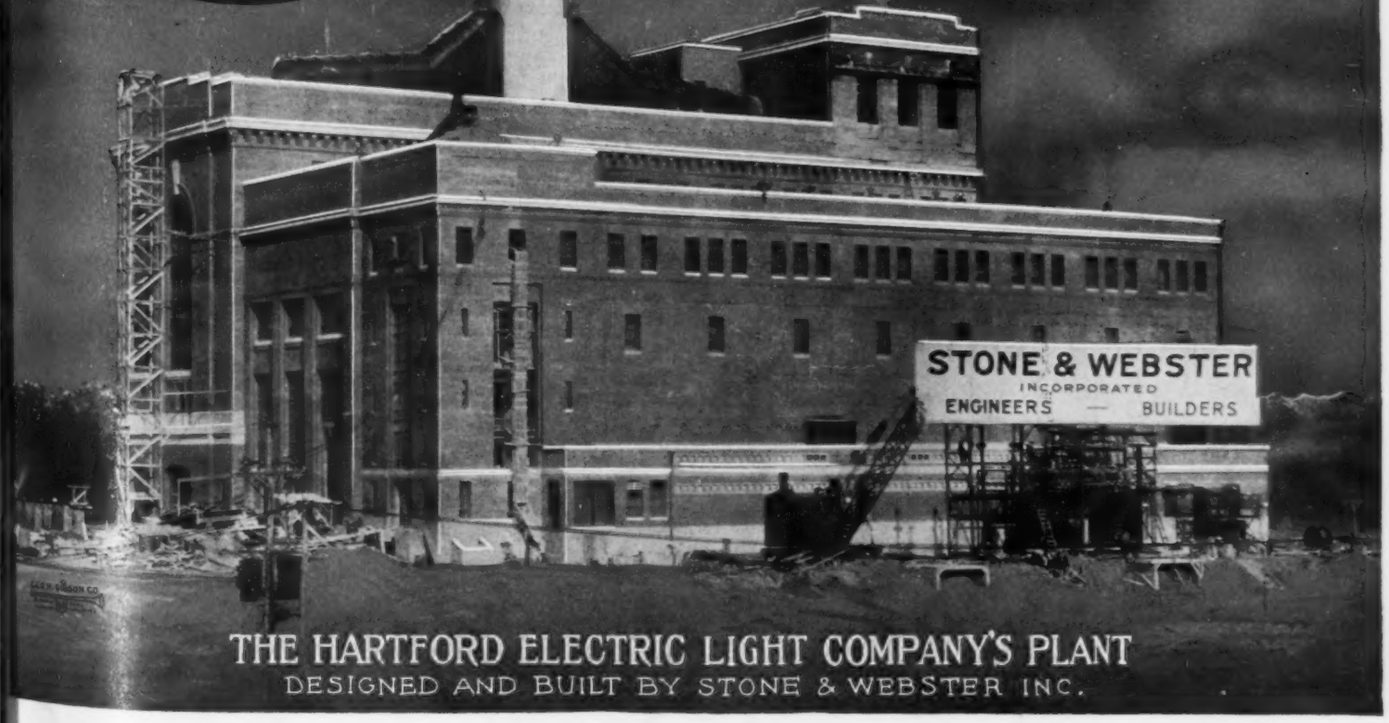

THE HARTFORD ELECTRIC LIGHT COMPANY'S PLANT
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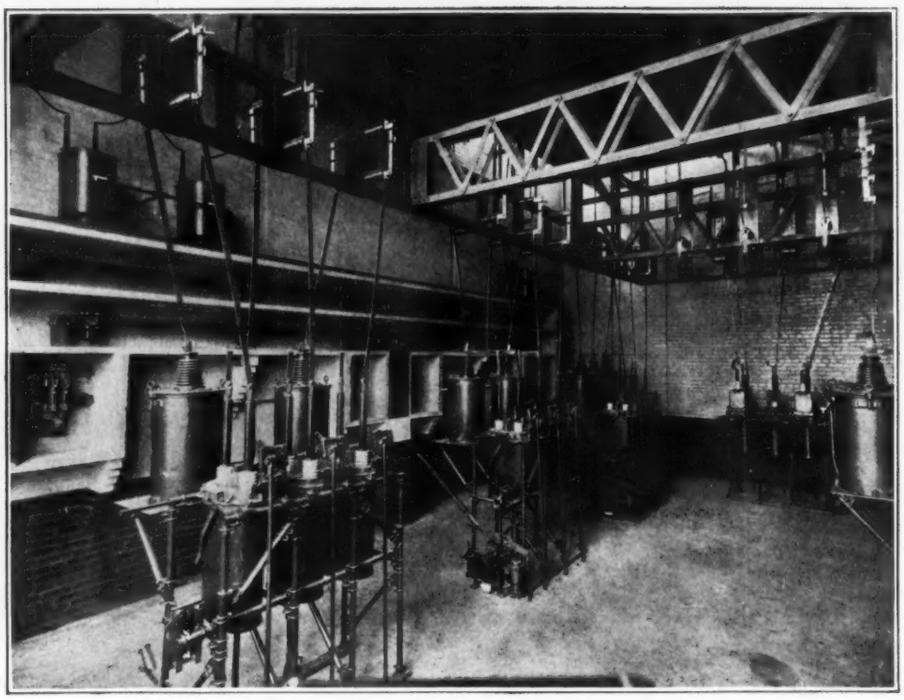
HIGH TENSION EQUIPMENT

ALL ELECTRICAL INTERESTS ARE POOLED



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In the electrical industry all our interests are pooled. All are penalized by the extravagance of one just as all are benefited by the economy practised by one.

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DELTA-STAR HIGH TENSION EQUIPMENT

UNIT-TYPE INTERCHANGEABLE PARTS

Electrical World

New York, Saturday, December 17, 1921

This Policy Brings Better Times

SOME seven million homes have been wired by the combined efforts of the entire electrical industry in the thirty-five or forty years in which wires have been installed in buildings. In just one-half that time one manufacturer of low-priced motor cars has introduced and sold five million of these automobiles to the same kind of people that have bought electric wiring.

There are two reasons why it has been possible for a single manufacturer to build up such a record. First, behind his selling there has been one continuous, clear-cut, unchanging policy. Second, behind the policy there has been the most persistent concentration of efficient work that has ever been applied to any product. Good policy and hard work under direct control of a single corporation have accomplished more in selling a new idea and a new service than all the diverse policies and scattered effort of the whole industry of electrical men.

W. W. Freeman, president of the Union Gas & Electric Company of Cincinnati and also of the Society for Electrical Development, made this interesting point in a recent address before the Electrical Supply Jobbers' Association. And his purpose was to drive home this hopeful thought—that success and progress come from good work supported by good policies, but that the work is worth more than the policy. For good work with poor policies will accomplish practical results that poor work cannot possibly achieve though guided by policies the best conceivable.

And it is good to keep this fact in mind, because no matter what the times, no matter how conditions may combine, good work lies within the power of any man. Good work offers to every one his surest opportunity, his greatest measure of success. And this is especially true right now for electrical men.

The electrical business is organized and maintained at present on the basis of these seven million wired homes plus that portion of industry already electrified. But there are fourteen million other homes unwired and waiting, with unconnected stores and factories in a fair proportion. Good work can wire these other buildings. Good work can build up this further market for everything electrical on the gigantic scale of this apparent 200 per cent of possible immediate increase. For in the homes and business places that now wait for wiring are the same kinds of people as those to whom we have been selling all along.

The policies of the different classes of electrical men should and can be more closely harmonized. It will help tremendously. But what we need the most just now is more good hustling work—and this is possible for every one of us right in his town, right at his job. The better times we want will come to meet each one of us along his way of better work.

Shiras Morris

Manufacturer and coordinator whose influence is a tower of strength in circles devoted to electrical material production

ACCURATELY to appraise the services of distinguished executives who for years have worked strenuously for the general good of the industry is no easy task. There are no instruments to measure energy expended in visualizing future needs, pointing out latent opportunities, co-ordinating diverse viewpoints and leading the way in constructive development. Men of this sort are in demand, not only because of their insight and ability to inspire others, but also because in their own businesses they prove the soundness of their judgment and test the principles by which they lead. These men practice what they preach.

Shiras Morris, president of the Associated Manufacturers of Electrical Supplies, of the Hart & Hegeman Manufacturing Company and of the Johns-Pratt Company of Hartford, Conn., treasurer of the Electrical Manufacturers' Council and of the H. T. Paiste Company, Philadelphia, is a leader of the foregoing type. Few important conferences in the wiring supplies branch of the industry are held without him, if his presence can be had Movements looking toward less duplication of effort in national and local organizations find in him a ready champion, and his keen interest in economics and his faith in the development of the electrical industry and its opportunities combine to render his opinion on policies and trends of business authoritative and much sought. Whatever Shiras Morris undertakes receives the full power of his enthusiasm. He is no hobby rider striving to convince the industry that he holds a panacea for the problems of complex scope which encompass the electrical manufacturer. Rather, he is a persuasive and direct reasoner of open mind and with vigorous opinions derived from wide activities, worth-while reading and an uncommon ability to put himself in another's place.

Mr. Morris was born at Pittsburgh, Pa., in 1875 and was educated in the local public and high schools, thence going to Trinity College, Hartford, Conn., where he was graduated in 1895 in the scientific course. Three years in the advertising department of the Pope Manufacturing Company at Hartford were followed by a term of naval service in the Spanish War. He entered the electrical industry in 1898 as office boy in the Hart & Hegeman plant, then having about twenty employees. His advance through every intermediate post to the presidency in 1914 has been accompanied by a rapid development of this concern, the size of which today is quadruple its size when he became its head. Upon the recent death of his predecessor in the presidency, Edward B. Hatch, Mr. Morris was elected chief executive of the Johns-Pratt Company.

Mr. Morris is active in civic and financial affairs in his home city, being a director in various banking and manufacturing concerns and a trustee of Trinity College and the Choate School for Boys in Wallingford, Conn. For three years he was secretary of the Electrical Manufacturers' Club, and he has been active in the Electrical Safety Conference Committee. For seven years he was a Water Commissioner at Hartford, and he has served in other unremunerative but publicly useful posts. He is keenly interested in employee relations and is a firm believer in the executive of a company being accessible to all coworkers.

Electrical World

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The New York City Electrical Union Scandal

ELECTRICAL men everywhere have been surprised and shocked at the practices which have been brought to light by the Lockwood committee's investigation of the electricians' unions in New York City. Men eager to join the union have been barred out and bled for temporary permits enabling them to work; employers have been victimized; the cost of building has increased. It is the old, old story of the misuse of power put into the hands of men unworthy to wield it and unequal to their trust.

It is well that this bad state of affairs is to be completely uncovered before a grand jury. Union officials must learn that they are representatives and not rulers. The workers must be awakened to the fact that they cannot safely pay their money, lend their collective strength and intrust their affairs to men who are left unguided and uncontrolled. And the public must not be prejudiced against electric service by a high cost of installation forced by self-seeking leaders who through deception have gained the indorsement and support of electrical wiremen and helpers, although as individuals these workmen would never countenance such methods. This is a matter which should have serious consideration if the electrical industry is not to be hurtfully misrepresented before the public.

Cost Accounting Must Back Public-Relations Work

PLEAS for better methods of cost accounting in central-station companies often are met by the assertion that the difficulties are too great and the information is not so essential as it is in an industrial plant because the central-station business is not a competitive one. The fallacy in the argument lies in the assumption that the only sort of competition to be feared is that which prevails in ordinary business dealings, where the success of a man or an organization is measured by the amount of business taken away from competitors. In that sense there is virtually no competition among central-station companies, though in a larger number of cases than is commonly realized there is a very keen competition with other forms of power. In a much bigger sense, however, there is more keen competition in the central-station field than in any other business field. The very protection given against the common forms of competition substitutes a competition for the good will of the public, because any failure to attain the desired result brings about a public controversy based on feeling that the central-station company is gaining advantages that could not be obtained if the public had the ordinary privilege of going across the street and trading with a competitor.

Back of all the excellent public-relations policies that have been developed in the last few years must be a full and complete knowledge of the business that can be obtained only by the same methods of cost accounting which have been forced by the common forms of competition in the ordinary field of business. There is no short road to this knowledge. It can be obtained only by a proper "set-up" of the accounting system and careful and periodic analyses of the various factors going to make up the business. It means expense, but very probably far less than is commonly supposed and certainly not proportionally greater than in the industrial field. The article by E. J. Burtt elsewhere in this issue contains some excellent suggestions for the smaller light and power companies, where the problem has seemed insurmountable. This problem may not be simple, but the biggest obstacle is the unwillingness to go even far enough to become acquainted with it. As in many other things, when the first step is taken many of the mountainous difficulties of anticipation become mere bumps in the road.

Water-Power Development and Depreciation

TO THOSE who have not followed closely the question at issue between the electric public utilities and the Federal Power Commission over the depreciation and amortization of water-power projects the controversy may appear trivial. The law stipulates that the licensee shall maintain a depreciation reserve adequate to maintain the project works in efficient operation and provide the necessary renewals and replacements. This all companies under regulation are already obligated to do, so that there can be no objection on their part to this provision. The objection to Regulation 16 of the Federal Power Commission is that it is not in accord with the spirit or letter of the law, because, owing to the life-table method of computing depreciation (which is not the method adopted by state regulatory bodies), not only is a depreciation reserve set up but part of the investment is amortized. This naturally means that the users of hydro-electric service must pay more than a reasonable rate for electricity in order that this excessive depreciation reserve can be set up and maintained. Posterity will gain in that the project works will cost it little or nothing, but the utilities recognize no such obligation to posterity, nor was it the intention of Congress that they should. No fault is being found with the law—it is possible to develop water powers under it—but with the rules and regulations; and even those are in the main reasonable. Where they are unreasonable is where they are theoretical because they do not coincide with experience, and the industry contends for practice as against theory. It is only begging the question to state that utilities under public service commission control are exempt from the regulation, because a careful study will reveal that while the devil may be kicked out the front door there is a back door open to

him. Nor should there be any favoritism shown. Manifestly the entire electrical industry and the public service commissions with all their experience would not be a unit against the regulation if it were just or reasonable; and one would think it would be the part of wisdom for those who are responsible for drawing up the regulation to recognize that fact. The presumption is that the country wishes its water powers developed, and Congress has recognized the mandate. Shall the intent of Congress and the wishes of the public be ignored then by a commission which flaunts its theory in the face of practice? We hardly think so, and we doubt if the Federal Power Commission will continue to think so when its members have rightfully considered the matter. The public service commissions of the country insist on adequate depreciation, so does the water-power law; anything beyond that is unwarranted and unreasonable excess.

Increasing Application of Electric Heat-Treating Furnaces

SURVEYS of the electric furnace field reflect a gratifying increase in the number and variety of heat-treating applications as compared with a few years ago. While the business depression now passing has retarded the installation of new equipment, there is little question that an era of large expansion is ahead for this class of electrical apparatus. At the beginning of this fall there were no less than eighty electric heat-treating installations completed or contracted for in the steel field alone. These are operating on many kinds of products, including steel and iron castings, automobile parts, tool steel, sheets, etc. At least seven heat-treating installations are operating on non-ferrous material, and their application to glass and other industries is also developing. The improvement of business in industrial plants dealing with metals and other materials requiring accurate application of heat in concentrated spaces will undoubtedly give a healthy stimulus to both invention and production.

A study of present installations discloses a surprising variation in furnace dimensions, materials, energy consumption and control equipment for particular tasks. The art is young, and experience is yielding much fruit to skilled designers. There seems to be little sign of "mass production" in the furnace field as yet, and while small apparatus suitable for laboratory use shows some evidence of potential uniformity in design, the range of dimensions and capacities for utilizing energy efficiently in the larger industrial units is extraordinary.

The time is fully ripe for the accumulation of graphic and tabular data on electric furnace design and performance, installation costs and operating expenses. It is to be presumed that individual makers of heat-treating furnaces have begun to compile such information. Its wider interchange would be of great benefit, both to manufacturers and users, for existing data are not sufficiently numerous to justify generalization from the experience of single furnace builders as to the best dimensions, materials and energy requirements for all-around maximum economy. The savings in material resulting from the intelligent use of electric heat treatment as compared with older methods are little less than amazing. Rigid standardization is not demanded by present conditions, but the variations in design and performance afford a fruitful field for study.

Huge Utility Bond Issue at Low Rate

THE rapidity with which the thirty-million-dollar, twenty-year first lien and refunding mortgage bond issue of the New York Edison Company was gobbled up shows that electric public utility securities, particularly those issued by the older and larger companies, are very attractive to investors. To be sure, the New York Edison Company's gross earnings are larger than those of any other electric public utility company in the world, and this particular bond issue is the largest so far offered at one time by an electric public utility corporation. The bonds sold at a premium of four and one-half points, yielding the investor at that price 6.1 per cent. While the money cost one and one-half points more than previous issues of the company, it is noteworthy that that is less than many national governments have had to pay for funds within recent months. It is also less than some state governments and municipalities have had to pay, considering the tax-exempt features of the latter securities. Nevertheless, every point is an added burden which must be met out of earnings, and when rates have not been increased it indicates that the company through more efficient operation has been able to effect economies which offset the higher interest rate. Unfortunately, the unthinking public does not always appreciate how many millions it is often spared through wise financing on the part of the utilities or by economical operation. The New York Edison Company is to be congratulated on rendering a service which includes both.

Joint Poles Have Become a Necessity

LITTLE investigation is required to recognize the immediate necessity for all signal companies and central-station companies to come to an understanding regarding joint poles. Not only will it be necessary to safeguard the public safety and the linemen's safety, not only will it be necessary also to consider all engineering features of the problem, but comprehensive and simple forms of agreement must be made. There are many reasons that point to the necessity of adopting a simple, effective and generally applicable policy regarding the use of joint poles. The present-day efforts toward conservation will require the saving of our timber. Many citizens are beginning to consider an excessive number of poles on streets and highways to be as unnecessary as it is unsightly. The same persons want the least expensive service possible from signal and central-station companies, and this demands economy in all directions. It will be difficult to make them believe that it is cheaper for those companies to operate over separate pole lines. Furthermore, the commissions representing the public, ascertaining and anticipating its desires, will be taking action toward the settlement of the question. Already such action is under way in many places.

Therefore it will be advisable for engineers and commercial men to prepare specifications and agreements and work definitely in the direction of joint-pole construction rather than wait for pressure from the outside. It would be well for the companies involved to consider that their reputation as public servants and the confidence of those whom they serve are in some degree at stake.

An Announcement by the Publisher

AS ANNOUNCED in the *Electrical Review* last week, the McGraw-Hill Company, Inc., has purchased that publication and will continue to publish it in Chicago, beginning January, 1922. This pioneer among electrical journals will be renamed *Electrical Review and Industrial Engineer* and become a practical monthly magazine devoted to the operation and maintenance of electrical and mechanical systems in mills and factories. It will form an extension of the work of the ELECTRICAL WORLD, whose constructive efforts in the electrical industry extend back for more than forty years.

I have come to regard the electrical industry more and more as an opportunity for service, with an ever-increasing influence on all phases of community life and development. From the early efforts of scientists and inventors there has grown up the great profession of electrical engineering. Founded upon this profession as a basis there has grown up in turn a far-reaching business—the business of making electrical service available in every nook and corner of the land, of bettering the living conditions in the home, of facilitating the routine of daily life and of mechanically and economically speeding up the wheels of industry.

In this development of the electrical industry, almost from the beginning, the ELECTRICAL WORLD and the *Electrical Review* as contemporary publications have mirrored electricity's progress, interpreted its influence, sought out the ideas and ideals of its leaders, and contended for right principles and right thinking in new lines of achievement. In the proposed co-ordination of these two forces a new avenue for an extended and correlated service is opened, a service that the spirit of the times and the needs of American industry are demanding in a specialized and extended scope.

AS IN the past, the ELECTRICAL WORLD, the national weekly, will be devoted to the problems of executives and electrical engineers responsible for the administration of policies, for engineering developments, and for practices in all branches of the electrical industry. Its editorial scope, except for broadening, remains unchanged, and embraces (1) the fundamentals of electrical engineering *as a profession*, (2) production, distribution and application of electrical energy *as a convenience service to the public and to industry*, and (3) the broad problems of production and distribution of electrical equipment and merchandise *as a business*.

The *Electrical Review* under the new title, *Electrical Review and Industrial Engineer*, will be devoted to the problems of electrical operation and maintenance in mills and factories, a field which the ELECTRICAL WORLD will continue to cover as it has in the past, but from a technical engineering standpoint.

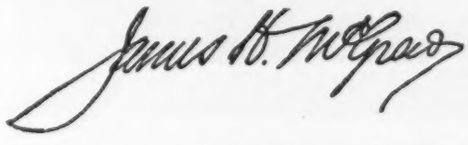
With the extended use of electric service in industrial production processes, there has grown a demand for specific and practical information on the operation of electrical systems by those who take up the work where the consulting, designing and installation engineers leave off. For these practical men a service not heretofore available will be provided.

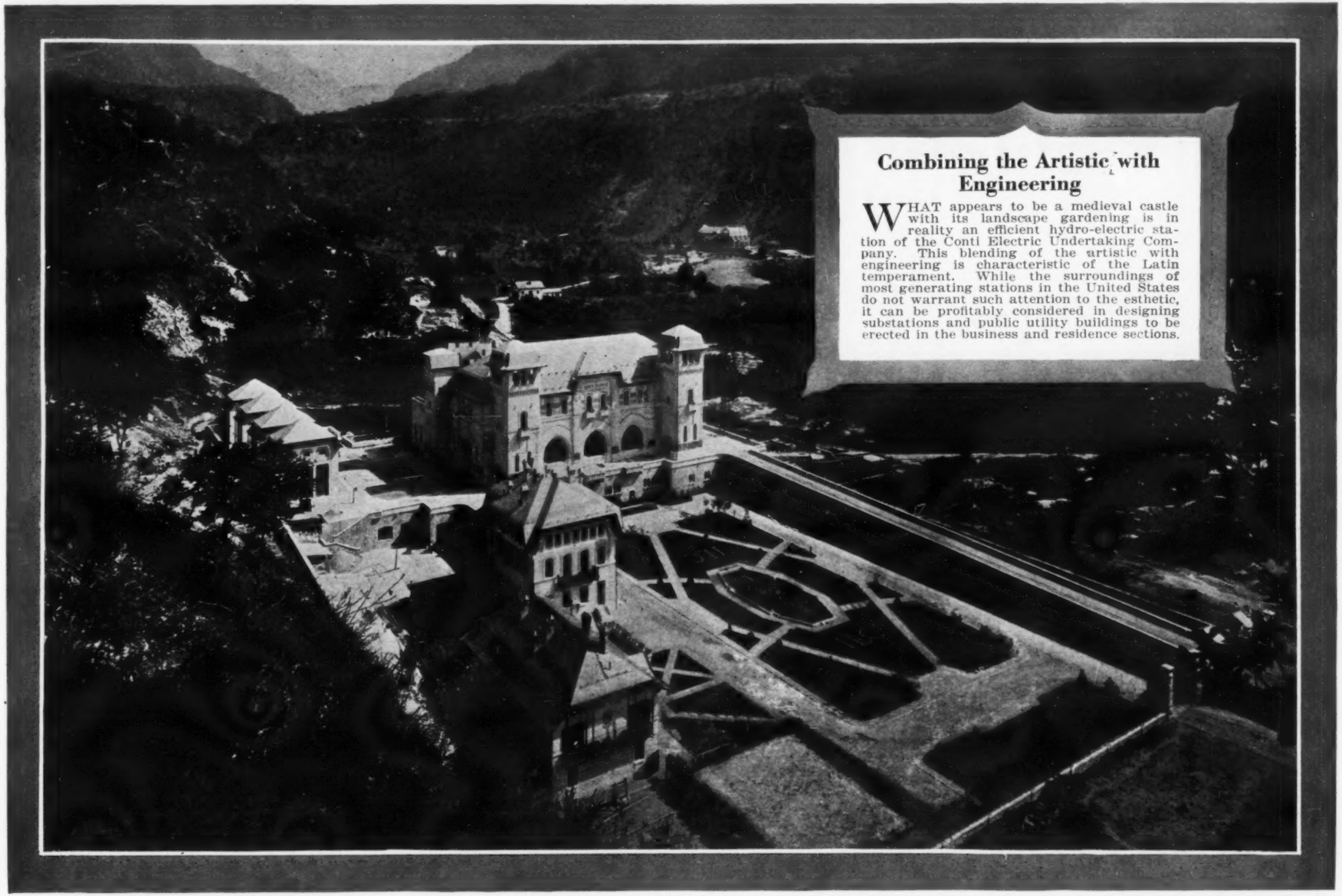
To maintain, through this broader and more clearly defined service to all groups of electrical men, high ideals of editorial standards and service and an intimate contact with the problems of readers will be the guiding ambition of the editors of the ELECTRICAL WORLD and *Electrical Review and Industrial Engineer.*

Present subscribers of the *Electrical Review* will be given an opportunity to select the publication that best suits their needs. They can continue their subscription to the new practical monthly, *Electrical Review and Industrial Engineer*, or change to the ELECTRICAL WORLD, *Electrical Merchandising*, *Journal of Electricity and Western Industry*, or *Power*, as may be desired.

AS I look back over the thirty-six years that have passed since I became interested in the electrical industry, from the vantage ground of an intimate contact with the various steps of its development, the opportunity looms greater now than ever before for engineers and electrical business men who hold dominating positions to come forward with initiative and leadership and render a constructive service to American business. Never before were our industries more in need of help—the help that comes from men of big brains and broad vision to conceive, to analyze, to formulate and to execute the plans necessary to remove from the path of social, industrial and economic progress the obstacles that lead to entanglements. In the electrical industry this desired result can be brought about to its fullest extent only by co-operation. Bigger, broader and better co-operation than has ever existed is essential.

To inspire, to guide and to assist to the uttermost in this work will be the sincere ambition of the editors and the publisher of these two nationally known publications under the direction of the McGraw-Hill Company, Inc.





Combining the Artistic with Engineering

WHAT appears to be a medieval castle with its landscape gardening is in reality an efficient hydro-electric station of the Conti Electric Undertaking Company. This blending of the artistic with engineering is characteristic of the Latin temperament. While the surroundings of most generating stations in the United States do not warrant such attention to the esthetic, it can be profitably considered in designing substations and public utility buildings to be erected in the business and residence sections.

Automatic Plant Permits Development of Small Power Site

Generator Started Simply by Energizing Line Connecting Automatic Plant to Main Station—Has Protection Against High Bearing and Generator Temperature, Overspeeding, Failure of Field or of Governor Oil Pressure, High Voltage, Low Load, Etc.

By C. M. GILT
Lighting Engineering Department, General Electric Company

IN ORDER to warrant the expense of constructing a small hydro-electric plant at an overflow and regulating station of the Holyoke Water Power Company an attendantless plant has been installed at this point. The generator is arranged to be started, synchronized and thrown on the line by the simple action of energizing the 6,600-volt line connecting the plant with the main station of the company. Another feature of the station is an automatically reclosing switch which energizes a feeder supplied from the plant. This station has given excellent service since May, 1921, having required but little attention and adjustment. The overflow and regulating station spoken of was situated between two of three canals which were built in 1859 for driving the waterwheels of mills. The water of the canals is still used for this purpose. The water levels are kept constant by the use of overflow weirs and gates for feeding and wasting. In order to utilize for power the water which was previously wasted intermittently in this manner, the Holyoke Water Power Company has installed generating plants at the regulating points. In carrying out this plan it was decided to install at an overflow and regulating station between the first-level canal and the second-level canal the automatic generating plant, which could be used, without attendant, for the discharge of surplus water or for feeding the second-level canal during times of deficiency. The fall at this point is 20 ft. (6 m.)

The generating unit consists of a vertical 625-kva., three-phase, 60-cycle, 6,600-volt, 150-r.p.m. General Electric generator driven by a single-runner Leffel waterwheel and controlled by a Woodward oil-pressure governor. The automatic station feeds into the 6,600-volt bus at the main station over a single line having no branches. This makes possible an extremely simple scheme of load dispatching; *i.e.*, the operator merely opens or closes the oil circuit breaker in the line to the automatic station whenever load or water conditions make advisable the addition or dropping of the automatic. An adjustable stop on the governor of the wheel limits the gate opening so that when set to hold a speed slightly above the system frequency the gate is opened to the position of the stop. The generator then delivers constant load and the governor acts only as a speed-limit device and a convenient means of operating the gates in starting and stopping. The governor is equipped with a solenoid-operated pilot valve that controls its operation. Whenever the solenoid is energized, oil pressure is admitted to the governor from the accumulator and the gates are opened, a dashpot and the compensating device retarding its action during the starting period. When the solenoid is de-energized, the governor closes the gates and oil is cut off so that the oil pressure will not be dissipated by leakages. A ring on the piston snaps into a groove in the governor cylinder, holding the gates closed against the unbalanced water pressure which tends to open the gates. The ring is forced out of the groove when oil pressure is admitted to open the gates.

Fig. 1 illustrates the wiring diagram of the station.

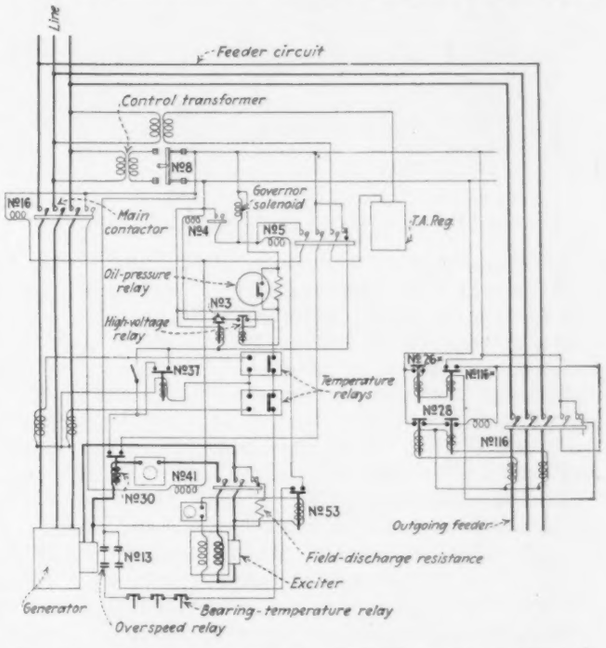


FIG. 1.—WIRING DIAGRAM OF AUTOMATIC HYDRO-ELECTRIC GENERATING STATION

When an operator in the main station wants the automatic station to assist in carrying the load, he closes the oil circuit breaker in the tie line between the two stations. The control transformer then supplies energy for the control circuit through switch No. 8. Contactor No. 4 picks up, energizing the governor's pilot-valve solenoid, and furnishing energy for the remainder of the operations. The governor opens the gates gradually, preventing overtravel and too rapid acceleration. A speed-control switch, No. 13, mounted on the shaft of the generator, closes its contacts when the generator reaches 95 per cent speed, and closes contactor No. 5 if the exciter voltage has built up, as indicated by the closing of relay No. 53. The closing of No. 5 immediately closes the 6,600-volt oil-immersed contactor No. 16, which in turn closes contactor No. 41, opening the field-discharge resistance and connecting the armature of the

exciter to the field winding of the generator. The closing of the main-line contactor No. 16 throws the generator onto the full voltage of the line without field. The generator is accelerating and the squirrel-cage winding on the field poles assists in pulling it into step. The exciter is connected at full voltage and the building up of the field flux locks the units in step. The squirrel-cage winding assists in damping out any tendency toward hunting.

This method of connecting the generator to the line

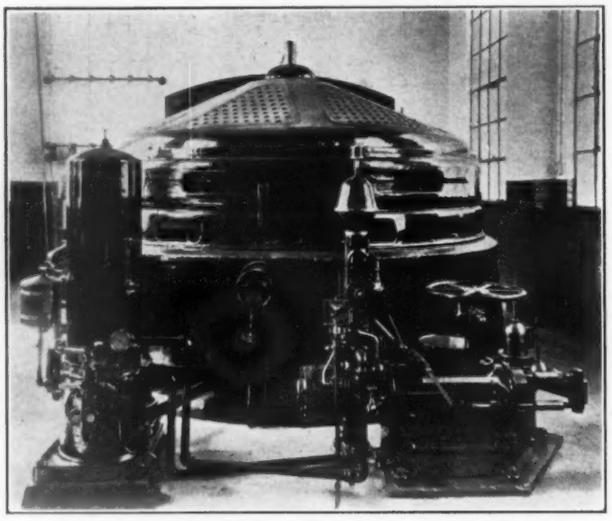


FIG. 2—AUTOMATIC GENERATING STATION SHOWING 625-KVA. GENERATOR AND GOVERNOR CONTROLLED BY A SOLENOID

is really less unusual and severe than might appear at first thought. Synchronous motors are thrown from the starting taps onto full voltage without field when they are required to start a load so great that they will not pull into step on starting voltage. The line disturbance is really greater when starting a synchronous motor in this way than it is when starting the automatic station. With the station there is only one application of voltage with the unit out of synchronism, while the motor starter has at least two steps. The generator is virtually at synchronous speed when it is connected to the line and field is applied, while the motor speed is appreciably below synchronous speed owing to the drag of the load. The time required for pulling the automatic generator into step is shorter, since the action of the waterwheel assists in bringing the unit up to synchronous speed, while the total energy for accelerating the motor and its load must be supplied from the line. The current drawn from the line is greater than that taken when an operator does a good job of synchronizing in the usual manner, but the shock to the line and equipment is less than that caused by a faulty operation.

When once connected to the line, the generator picks up load as determined by the governor setting. When the operator in the main station decides that the automatic unit is no longer needed, he opens the breaker in the line to the small station. An underload relay No. 37 opens the circuit of relay No. 3, which after a short delay opens the control circuit and shuts down the station. The underload relay may be short-circuited so that the unit will not shut down when carrying the light Sunday load.

The generator is carefully protected to prevent damage. Oxide-film lightning arresters bleed off voltage surges before they can puncture insulation. In each bearing there is a sylphon-type thermal relay that will open its contacts and shut down the station if the bearing temperature approaches a dangerous value. These relays are hand-reset so that the station cannot restart until an inspection is made. Temperature relays are heated by the secondary current of current transformers and have thermal characteristics similar to that of the machine. If the generator is overloaded for a period such as to bring its temperature up to an abnormal value, these relays will open their contacts and shut down the station before the temperature becomes dangerous. Relay No. 53 will clear the generator from the line if the exciter fails. A field relay No. 30 will de-energize No. 3 and shut the station down after a short delay should the field circuit open during operation. In case of high voltage the high-voltage relay will shut down the station or prevent it from starting. The oil-pressure relay will produce the effect of high voltage by short-circuiting resistance in series with the high-voltage relay, if the governor oil pressure drops to a point that jeopardizes continued operation. In case of overspeed switch No. 12 will open and clear the generator from the line and cut the excitation off. If a short-circuit occurs between the automatic station and the main station, the oil circuit breaker in the main station will open and the automatic station after shutting down because of low voltage will not start until the line is re-energized.

A feeder circuit with overload protection and reclosing equipment is included to feed a particular load whenever there is water to operate the automatic station. In case of overload on this feeder the overload relays will open the contactor No. 116, and after a short delay relay No. 116-X will pick up and close the line contactor. At the same time the notching relay No. 26-X will move up one notch, but will not open its contacts. If the trouble is cleared and the contactor re-

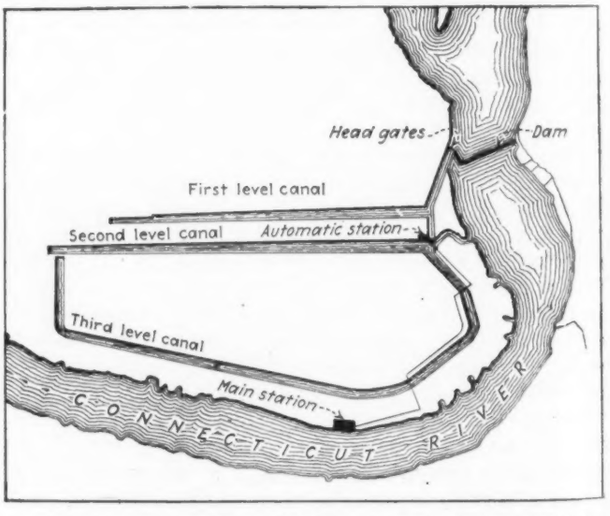


FIG. 3—THREE LEVELS OF CANALS AT THE HOLYOKE PLANTS

mains closed, the notching relay will reset itself after a short time. If, however, the overload conditions remain so that the contactor again trips out, the operations will be repeated. If the breaker opens a third time in immedate succession, the notching relay will open its contacts and lock the contactor open until reset by hand. The relays, therefore, take the place of an operator in trying out the circuit.

Possible Economies in the Cost of Insurance

The Advantages that Would Come of Self-Insurance for Small Losses, Both in Reduced Expense and Fewer Fires

BY "KASSANDRA"

IN A RECENT report to the N. E. L. A. reference was made to certain dangers not now coverable by insurance, and the statement was made that if a real demand existed for that form of insurance, the underwriters would arrange for the proper policies at a proper price. It is a familiar story that the English Lloyds will insure against anything even to twins, and this is, after all, the general natural attitude. Anything is insurable at a price and inversely to reduce the cost of insurance it is only necessary to reduce the risk and the form of policy. There is one such economy possible right now that will not only save money but reduce the fire loss as well to all insurers.

The ordinary insurance policy provides for payment in case of any loss, whether large or small. If the policy be for $100,000, payment of this sum may be recovered in case of total loss, and a small loss of, say, $100 is also paid by the insurance company.

THE COINSURANCE CLAUSE

We can therefore consider the policy as having in effect the value of several policies, for example, three, the first providing for payments in case of total or very large losses, down to say $75,000; the second for payments in case of losses of intermediary size, say between $3,000 and $75,000, and the third for payments of the small losses up to say $3,000 in any year. An insured can have one policy covering against all losses, or theoretically he could have three policies each covering against losses between definite amounts. In practice, however, the insurance companies provide only one —which amounts to the insurance against small losses only. This policy covers any loss suffered up to the amount insured for, but in most cases there is a coinsurance clause, which applies when a man takes out several policies on the same level, say four policies of $2,500 each on a ten-thousand-dollar level. The coinsurance on a partial loss prevents him from collecting a loss of $2,000 several times—$2,000 from each policy. He can only collect the total of $2,000 pro rata from each policy.

But suppose that he had only one two-thousand-dollar policy on the ten-thousand-dollar house and had a loss of $2,000. He would have paid for this say $20 against $100 for insurance for the full value. Obviously that would be much worse for the insurance company than if the man had carried the full amount of insurance, and therefore the coinsurance clause provides that in such a case the insurance company will only pay the same sum that it would have paid if the man had carried insurance up to say 80 per cent of the value of the house.

Sometimes policies are issued without this coinsurance clause, but in such case, of course, a higher premium is paid. Or, vice versa, if the standard premium is on a policy without a coinsurance clause, then a reduction in that premium is given to the man who will take policies with a coinsurance clause.

The result of this method is that most people who insure carry insurance up to 80 or 90 per cent of the value of their property. Then in case of any fire or loss up to this 80 or 90 per cent, the insurer gets all his loss back. If, however, he has a complete loss of the whole value of the property, say $10,000, he only gets $8,000 back and is really insuring himself for the last $2,000. He knows that fires that cause a complete loss are comparatively rare and is willing to run that chance in order to save the premium on this last $2,000 of insurance.

SELF-INSURANCE

If an insured can get a three-thousand-dollar policy without a coinsurance clause on a one hundred-thousand-dollar risk, he is covered against all losses up to $3,000, but may be hurt badly by a large loss. In other words, he is insured by an insurance company against the small losses. There is no reason, however, why an insured should not reverse this and insure himself against the small losses while carrying insurance against large losses. He might even combine the two and carry his own risk both on rare large losses and on smaller losses and enjoy the constant saving from a reduced insurance cost. In other words, my suggestion is that either instead of or in addition to the owner of the house insuring himself against the last $2,000 of the loss, in case of a complete fire loss, the owner of the house should also be allowed to insure himself against the first $500 of loss; that is, to insure himself against any losses that do not exceed $500 during a year or during the term of the policy.

This plan is similar to the provision in automobile theft insurance that no losses shall be paid unless they exceed $25, so that if a man merely has a wrench or an ordinary robe stolen out of his car, he has no redress, whereas, on the other hand, he is really protected against the theft of his whole car or of valuable appurtenances.

PROTECTION AGAINST LARGE LOSSES

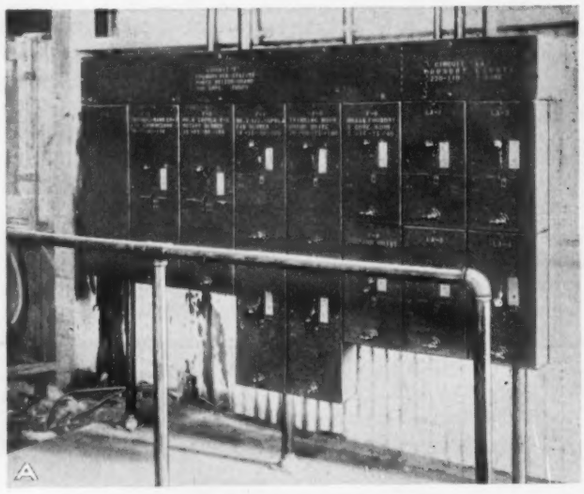
The advantages of such a policy are obvious. Year in and year out the careful man would be able to keep his loss from small fires away below the saving in his premium. Occasionally he might have a year when he made no saving. In fact, he might occasionally suffer a small loss, but he would never be crippled or even hurt since in case of a large loss he would be covered.

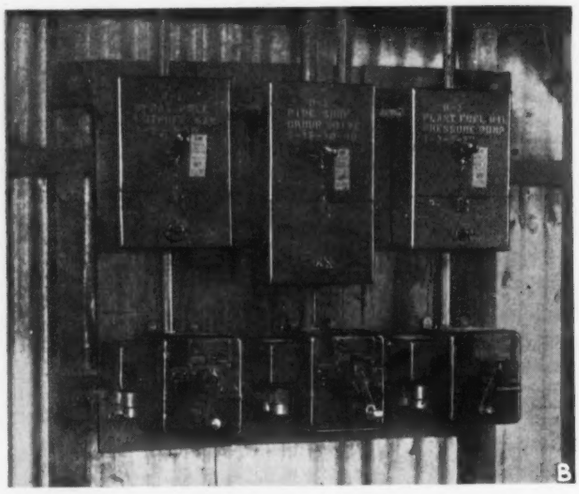
To the careless man who has frequent small fires this plan would bring no saving, but he is the danger spot and should be discouraged by a high premium, or, rather, penalized and influenced to reform.

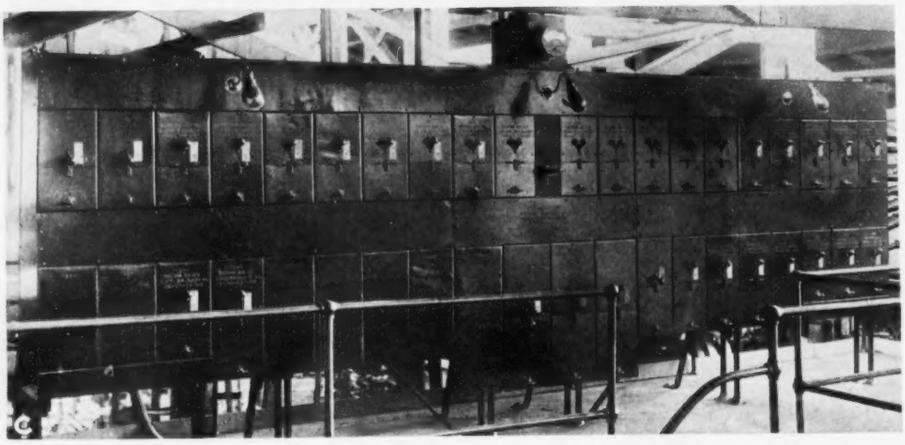
The kind of insurance agent who is merely looking after larger premiums on which he can collect a larger commission will not welcome this new form of policy, but the high-minded insurance company officers, who really desire a smaller fire loss, should be willing to provide such policies if they are demanded.

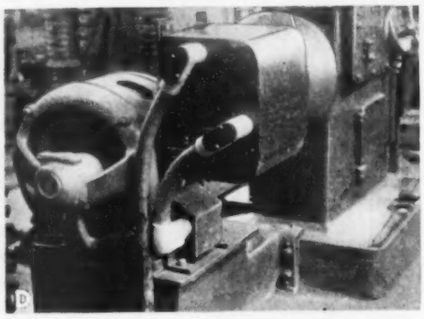
It is therefore merely a question of educating the insured until they demand policies under which they can insure themselves against the smaller losses which they can easily stand, while being insured against the large losses which might cripple their business.

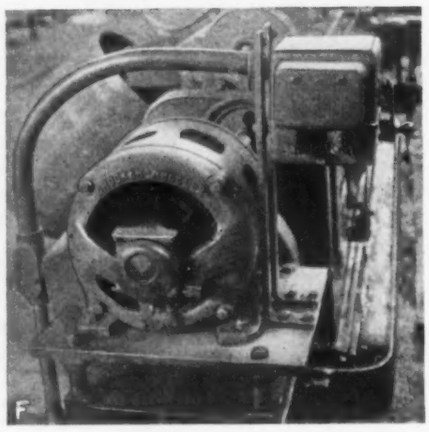
If we will only ask for such policies and ask hard enough for them, we shall get them. The careful man will then make savings, and there will be a greater incentive to be careful and a total fire loss less than is now the case. Insurance companies, however, can hardly be expected to act until such policies are wanted.











All Live Parts Are Covered from Switchboards to Motors in San José (Cal.) Industrial Plant

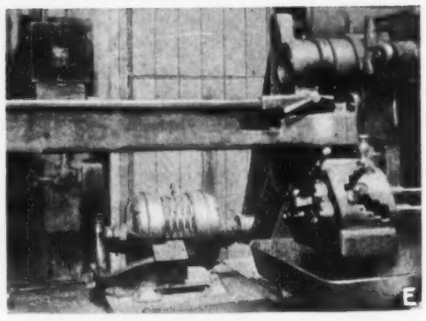
A—Small distributing board. Each switch is numbered and the name of the apparatus controlled is stenciled on the cover.

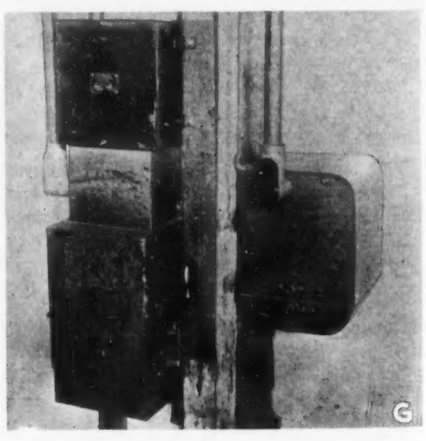
B—Motor controls are grouped at some points as shown in this photograph.

C—Main distribution switchboard designed for safety and for plant growth.

D, E and F—Different motor applications call for adaptations of connections, but in each case all live parts and wiring are inclosed.

G—Old compensators made safe by addition of inclosing cases.





Plant Distribution Layout Combining Safety and Economy

How an Industrial Plant Has Met Problem—All Live Parts Inclosed on Board and at Motors—Relay Protection for All Motors—System Is Reliable, Safe, Flexible and Economical

BY I. A. OLIVER
Plant Engineer Bean Spray Pump Company, San José, Cal.

AN INDUSTRIAL-PLANT distribution system combining marked safety, reliability, flexibility and economy was the object of the reconstruction carried out during the past year in the Bean Spray Pump Company's plant at San José, Cal. Switchboards with "dead" fronts and backs, inclosed wiring at the motors and relay protection for each motor are some of the means used for obtaining this object. This reconstruction had become necessary owing to the plant's rapid growth causing continual relocating of motors and machinery to accommodate production. The old system was very inflexible, seriously lacked modern safety equipment and had become heavily overloaded. As a complete revision was necessary, it was decided to make the new installation a model of its kind.

General Purposes of New Design

The principal factors considered in planning the layout were (1) the most efficient power distribution with the least apparatus, comprising the installation of the highest quality and safest equipment obtainable and at the lowest possible cost; (2) "safety first," that the entire system should comply with all safety requirements; (3) flexible installation, adaptability of the system to changing conditions, motor relocation and future additions, and (4) changing over and adapting the old equipment wherever possible.

There were fifty-eight motors with a total connected load of 600 hp. and a full-load current of 1,450 amp. at 220 volts. The maximum demand averaged about 300 hp. In planning the main feeders and the main switching equipment ample additional capacity was allowed, providing for 50 per cent to 75 per cent increase in growth of the plant. Nearly all the motors were three-phase squirrel-cage induction type, the majority being rated at from 5 hp. to 10 hp. One compressor is driven by a 104-hp., three-phase wound-rotor induction motor. With a few exceptions this motor load was widely distributed throughout the various shops in the plant, which covers an area of four acres.

Power enters the plant at 2,200 volts and is stepped down to 220 volts, metered and served to the main entrance switch on the central switchboard, which controls the power for the entire plant. This main switch is a 1,500-amp., three-pole, copper-link fused safety switch and is one of the most highly rated safety dry switches built. It is mounted on the main board at the center over the busbar compartment, as shown in Fig. 1. This switchboard consists of nine safety switches substantially mounted on a simple iron frame with pipe legs. The busbar compartment is built of black iron and contains the laminated flat bare copper busbars extending the full length of the board and supported at

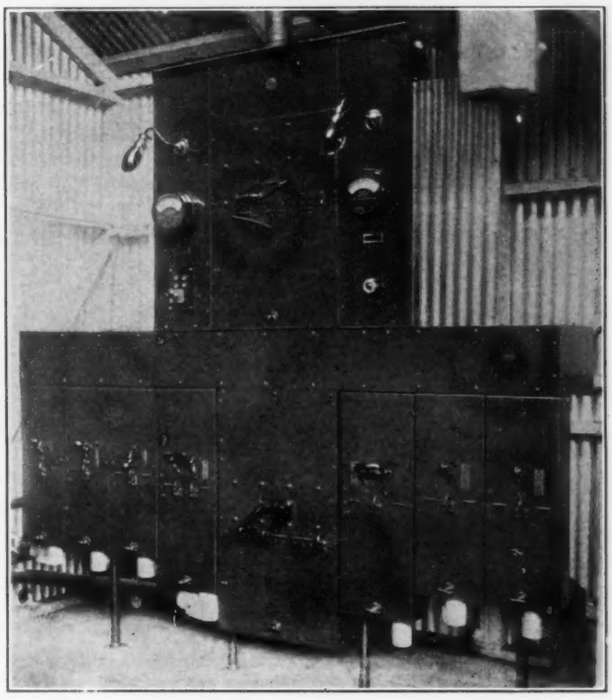


FIG. 1—1,500-AMP. DRY-TYPE SAFETY SWITCH CONTROLS MAIN POWER SUPPLY

intervals by "Bakelite" micarta blocks suspended from the top of the compartment. Each switch is connected to the buses by rubber-covered stranded leads. The main 1,500-amp. entrance switch is connected to the buses by flat copper bars.

The switches are mounted flush and produce a compact, economical job of pleasing appearance. All live parts are entirely inclosed. Extended sheet-iron compartments on each side of the main switch provide suitable mounting for voltmeter and ammeter with accessories. The circuits are led away from the bottom of the switches in the usual manner. Distribution of main circuits to the various sub-boards is by underground and overhead system.

Sub-Distribution Boards

The machine-shop switchboard controls twenty-nine motors and is the largest in the plant, being itself fed through a 1,000-amp. main switch. This board is mounted on an elevated platform conveniently placed near the center of distribution. As shown in *C* (page 1216), it is also built entirely of safety switches. These are arranged in two rows, top and bottom, with a set of buses and bus compartments for each row. They are

grouped according to size, the largest being placed at the lower center. There are at present twenty-four 60-amp., six 100-amp. and three 200-amp. switches connected in, and blanks are provided for two 60-amp., four 100-amp. and one 200-amp. switches. All switches are three-pole and fused to the required capacity for starting the motors that each controls. Power is received over three 1,000,000-circ.mil weatherproof cables carried on an overhead trestle a distance of 200 ft. (60 m.) from the main board. The cables are attached to the upper ends of the tie buses which connect the top and bottom buses through the compartment at the middle of the board.

The buses in the top and bottom compartments are built up of flat bare copper straps, $\frac{1}{16}$ in. x $1\frac{1}{2}$ in. (1.6 mm. x 38 mm.), laminated. These are gradually tapered off toward the ends of the boards as the required capacity decreases. Spacings and insulation were carefully worked out and dangerous magnetic circuits carefully eliminated or properly broken up to prevent eddy currents. At the back of the board, as shown in Fig. 3, one conduit duct is provided for each

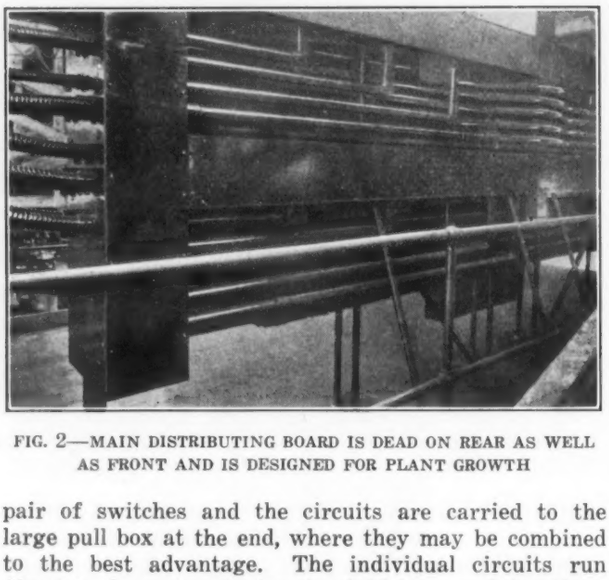


FIG. 2—MAIN DISTRIBUTING BOARD IS DEAD ON REAR AS WELL AS FRONT AND IS DESIGNED FOR PLANT GROWTH

pair of switches and the circuits are carried to the large pull box at the end, where they may be combined to the best advantage. The individual circuits run direct to the motor starters in rigid iron conduit. Short pieces of flexible conduit are used to connect the conduit lines to the pull box on the switchboard to prevent any vibration being transmitted to the board. A maximum of three three-phase circuits were run in each conduit. This was decreased in size at each point where a circuit was branched off.

Each motor starter in the plant, regardless of size, is equipped with an inverse-time-limit overload relay and a magnetic undervoltage release. *G* (page 1216) shows how the old equipment was brought up to date and made safe. All the old starters that could be used were modernized by attaching inclosed overload relays. Auto-starters with self-contained inverse-time-limit overload relays and magnetic undervoltage release are used in the new equipment for the larger motors throughout the plant.

From the starters the circuits are carried in rigid and flexible conduit to the motors, where special terminal boxes were installed to fit each type of motor, thereby protecting the wires and grounding the motors and starters to the entire system. This arrangement provides safety and flexibility with the smallest amount of apparatus. The thread ends on all conduit used were thoroughly cleaned to remove the insulating enamel, thus insuring a continuous ground in all parts of the system.

In all other shops of the plant similar equipment is used. The switchboard in the foundries shown in *A* (page 1216) is of the simplest design. It is 100 per cent safe. The pipe-shop switchboard, as shown in *B*, is a characteristic arrangement of motor-controlling apparatus used in various places throughout the plant where a few small motors are operated within a short radius of a central point of control. The type of motor-starting switch employed is well adapted for this purpose.

All switches and motor starters are plainly marked. The circuit-controlling switches at the main board are lettered alphabetically. The switches on the distributing boards and also the motor starters are each lettered according to the main circuit they are on, and in addition they have a number which designates the particular machine or circuit they control.

The entire work of changing over to the new safety equipment was undertaken at a time when the plant was at its heaviest production, most of the machinery being operated day and night. This required considerable parallel temporary wiring as well as temporary cut-overs. The new equipment was installed and completed right up to the motors, then the cut-over was made during the lunch hour or at times when the motor could be stopped for an hour or so. The entire job was accomplished with very little interruption of machinery or production. Every precaution was taken in this work, with the result that not one accident occurred.

Specifications for Lamps Issued by Government

NEW specifications for large incandescent electric lamps have been issued by the Bureau of Standards. These specifications have been prepared primarily for the use of government departments when purchasing lamps, but are also available to others. This is the ninth edition of the bureau's lamp standards.

There have been some changes, an important one being the abandonment of the long-established provision that the light test of lamps shall be considered as ended when the candlepower has fallen to 80 per cent of the initial value. Because means have been found to prevent excessive blackening of tungsten lamp bulbs, the new tests are based on the total life to the time of burn-out.

The performance of the lamp throughout its life is taken into account through two new provisions, one being the valuation of life-test results on the basis of average efficiency throughout the lamp's life instead of the initial efficiency, and the other requirement being that the average light flux during the life of the lamp must not fall below a specified percentage of the initial flux.

Tolerances have been established for possible variations in tests resulting from the small number of test samples available. Furthermore, standardization of lamps is on a smaller number of gradings, the tungsten schedule recognizing only the 5-volt steps in the 110-120 range and the 10-volt steps in the 220-250 volt range.

The publication of these specifications is now ready and may be obtained from the Bureau of Standards, Washington, D. C.

Cost Accounting for Small Companies

Need Exists for Better System—Study of Apportionment of Costs to Various Classes of Service Will Yield Results—Some Suggestions as to Methods

By E. J. BURTT
Jackson, Mich.

AT THE present time, when central-station companies have idle capacity and rate readjustments are being made, it is opportune that they renew their efforts to analyze the total costs of supplying their different groups of consumers. With correct information of this nature any adjustment in rates which it may be necessary to make can be done with the assurance that the revenue under the new rates for the class of service affected will at least provide for its production and distribution and not throw an additional burden on the remaining classes of service.

As a general rule, in the smaller electric light and power companies the apportionment of fixed charges to the different classes of service rendered has not been carried out to the same extent as in the case of operating expenses. Perhaps one reason for this is that central-station companies are not considered to be subject to the keen competition that exists between manufacturing establishments, and that it makes little or no difference whether the "overhead" is prorated or not. In any business that encounters strong competition it is necessary that the true cost of each line be determined. If these costs are not known and the price of the article is not based upon these true costs, sooner or later the firm will find itself in serious difficulty.

The general idea held by many that the central-station business does not meet competition is not altogether correct. The contention may largely be true in the lighting field and perhaps in the small-power field, but it is not true in the larger power field. The power sales are a very large percentage of the present central-station business and the percentage is constantly growing. In the power business the central-station companies are subjected to a very aggressive competition from isolated plants. Many of these plants were built during the war. Then the increase in the refinement of design, and consequently in the efficiency, of internal-combustion engines is a factor to be reckoned with. The low price of crude oil also should be considered, because this will act as a further incentive for introducing the newer types of oil engines as competitors of central-station service.

Cost of Energy for Different Services Should Be Known

In view of the above, it will be seen that central-station companies are subject to more competition than is commonly supposed and that the true costs of generating and distributing energy to the different classes of service should be known. Not only should they be known so as properly to base the power rates, but also to prevent the placing of an additional burden on other classes of service. By ascertaining these true costs the basis for an equitable rate schedule may be determined. With such a rate schedule a company need not fear the investigation of any governing body and will not be subject to criticism in case an investigation is made. Then, again, the commercial department will be in a position to meet new situations and opportunities that are constantly arising in the power business.

For want of sufficient information many central-station managers do not attempt to make a study of these true costs. In the first place the fair value of the plant must be known. This, in turn, must be allocated to determine how much of the carrying charge shall be allotted to cost of carrying each class of business, and there are several methods by which this can be done. In the second place, the apportionment of operating expenses for costs of generation and distribution, as well as for commercial and general and miscellaneous expense, must be made. At first any attenpt to make an allocation of the two classes of expense seems difficult and unsatisfactory. Still, if time and study are applied to this problem, fairly satisfactory results are obtained.

Method of Allocating Costs

Following is a brief outline of the general method used to determine the annual costs of supplying energy to the different classes of service in a central station supplying a city of about 60,000. Satisfactory results were obtained, and this outline is given here with the thought that it may afford assistance to those who are making an analysis for the first time.

For a starting point an appraisal of the property should be available from which the value of the generating and distributing systems is to be determined. In case there has not been an appraisal made, the fair value of the property can be determined from the plant and investment account on the company's books.

It is generally conceded to be fair to prorate the value of the generating equipment to be carried by each class of consumers by using the percentage that the demand of each class bears to the total load in kilowatts on the station at the time of the maximum peak load. In substantiation of this idea the following case is submitted: In a small town, where the total load on the station is residence lighting, it is self-evident that all charges would be against that class of service. Now, if one-half of the maximum load at the time of the station peak was lighting and the other half was power, then the station investment cost should be in the same ratio. With an increase in the number and kinds of classes of service, the plan would still hold true.

To allocate the value of the distribution system is more difficult. There are several factors which have an influence in this apportionment—among them being the rate of taking energy, or the kilowatt demand; the volume of energy, or the kilowatt-hours, and the number of consumers in each class. In the average-size cities central-station companies would have as the principal classes of consumers the following: Municipal

street lighting, residence lighting, commercial lighting, small power, secondary power and primary power.

One method of prorating the distribution investment often used is accorded to the "number of pole contacts" or the miles of wire line in each class. Another method, perhaps more satisfactory, is to make estimates showing the cost of constructing distribution lines to supply separately the total number of consumers in each class. In the case of a typical residence consumer, this would include: (1) Meter, (2) service, (3) secondary lines, (4) transformers, (5) primary lines, (6) sole lines, and (7) necessary labor.

After these estimates are made up covering each class of consumers, the total of several estimates may be found and the percentage of the total estimated cost may be determined for each class, and this percentage can be used to prorate the actual appraisal value.

After a complete allocation of the value of the property has been made, the yearly amount of fixed charges that are to be carried by each class can be readily determined. These fixed charges should include such items as: (a) Return on the investment, (b) taxes, (c) renewals and replacement, and (d) insurance. What rate of return or depreciation shall be used should be determined for each separate property, depending upon the condition of the plant, its earning capacity, etc.

In addition to the fixed charges as shown above, the operating expenses must be also prorated. The first division will be between generating and distribution costs. In actual practice the idea of considering the generating department by itself, with expenses connected with production averaged at so much per kilowatt-hour, seems the most satisfactory. This means that each class of service is charged with the cost of energy to the distribution switchboard in the same proportion as the amount of energy taken by it. These expenses would include station superintendence, labor, fuel, water, lubricants, and station and equipment repairs. The balance of running expenses would be made up of distribution, utilization, commercial, general and miscellaneous.

Under these different headings would be classified the following expenses:

Distribution.—Superintendence, wages, setting and removing meters and transformers, maps and records, shop expenses, repairs to line equipment, meters, etc.

Utilization.—Wages, street lighting, customers, equipment inspection.

Commercial.—Uncollectible bills, salaries of meter readers, salaries of accounting department, promotion of business.

General and Miscellaneous.—Salaries of officers and clerks, office rent, printing and stationery, legal expense, injuries and damages, miscellaneous.

A detailed study will have to be made in order to allocate these distribution expenses correctly. It is self-evident that such items as meter reading and billing should be charged in the same proportion as the number of consumers in each class. Setting and removing transformers would require special analysis as the expense should be charged in part on the basis of kilowatt-hour sales and kilowatt-hour demand, while meter expense should be charged on the basis of kilowatt-hour sales only.

Under "Utilization" street-lighting expenses, of course, would be charged direct, as also a proportion of the distribution superintendent's salary.

The various items under "Commercial" and "General and Miscellaneous" could be prorated to the different classes by considering the number of consumers, the demand in kilowatts and the kilowatt-hours used by each class. In other words, weight should be given to these three factors in the alllocating of these charges.

The scope of this article will not allow detailed consideration of all classes of expenses entering into the cost of generating and distributing electricity, but enough items have been mentioned to indicate what disposition should be made of others. Each station would have to be considered as a separate problem. With all expenses covering investment, production and distribution classified as in the general outline above, it is a simple matter to determine the annual cost fairly chargeable to each class.

To determine what proportion of the station's annual peak kilowatt load should be allocated to each group of consumers will require a study of the company's sales and operating conditions and the general character of the business served. Certain factors which are common to all plants will assist in this study. From handbooks can be taken data relating to yearly load factors and diversity factors which will be found applicable to the plant under consideration. Diversity factors can be determined by making special investigations in sections of the locality served. Time and thought given to the question will yield results which will be of valuable assistance.

The larger companies are constantly making studies of this nature and find them absolutely necessary. The changes from time to time may be of small consequence, but the constant scrutiny of expense and the scientific handling of accounts enable the management to keep in close touch with the operation of the property under its charge. There is no reason why the small companies also cannot make these detailed studies to learn the cost of supplying each class of service. The results cannot fail to be profitable.

Electrical Progress in Sweden

ACCORDING to a comprehensive article recently published in Stockholm and quoted by the *Swedish-American Trade Journal*, while the available statistics for 1917 gives the electrified acreage of cultivated land in Sweden as 6.4 per cent of the total arable land of the country, the corresponding statistics for 1920 show about one-third of the cultivated ground to be electrified.

The Alvkarleby power station serves by far the widest territory, a total of 300,000 hectares (a hectare is a little less than 2½ acres). The Motala power station supplies a total of 60,000 hectares, the Trollhättan power plant wires cover 127,000 hectares, and a fourth large power station is that of the South Swedish Power Company. Thus the southern and middle parts of Sweden are well provided for by large and strong plants.

In the northern part of Sweden, on the other hand, there are as yet no large central power stations, except that the Alvkarleby lines cover part of the territory. However, there are many small water-power plants, and these are increasing in number. In many localities the people have clubbed together and installed turbines in the rivers in order to supply local needs.

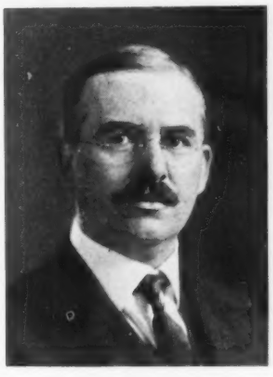
Electric cooking is growing in popularity in Stockholm and the central-station company is planning reduced rates for this service.

Problems Confronting Electrical Apparatus Manufacturers*

Need for Developing Demand and Increasing Number of Machinery Manufacturers Fostering Motor-Driven Unit Sales

BY R. J. RUSSELL
President Electric Power Club

DURING the entire year, with marked frequency, problems have been brought to us for solution that have been hard indeed. The degree of confidence we individually have had in ourselves, our organization and the future of the industry is expressed in the effort put forth to meet these problems. We have for several months heard men prominent in finance and business say that business has turned the corner. This statement has caused many of us to wonder what has been the matter with our conclusion-reaching system that we have been prevented from enjoying that mental satisfaction. If we go far enough into this statement, "business has turned the corner," and try to analyze it thoroughly, we shall appreciate that it has turned for those who will work hard and systematically and humbly to create business, but for the others there is nothing but crumbs, as is always the case under normal conditions.



R. J. RUSSELL

That business has turned the corner no one who reads will dispute, although, if he reads carefully, he will admit that it will take some time for it to assume a healthy appearance. It will improve with effort on the part of individual business itself. Money is cheaper, commodity prices indicate adjustment, and prices of electrical apparatus are favorable as compared with pre-war prices. September electrical exports had a value of $4,879,000, 67 per cent of the figure for September, 1920, while for nine months they were $81,730,000, or 20 per cent more than for the same period in 1920 or in 1919. The railroads are doing some buying, and the public is now in the mood for making every one, including railroads, public utilities and labor, adjust conditions with some regard to supply and demand, which, after all, is the great leveler of prices.

The electrical apparatus industry is entitled to a very large amount of credit for having been so fair in the matter of price during the war and in 1920, when the percentage of capacity schedule was so favorable, and for having reduced prices in the last year to a point so close to pre-war figures. The industry will get this deserved credit, too, if you only let the facts be known through your organizations. The information properly spread will help some to decide to buy now.

I want to submit to you that altogether too great a percentage of the business done by some manufacturers in the electrical line is not created by them; it just grows naturally, like Topsy, and is wafted their way somehow from somewhere, and of whatever kind or character or in whatever respect special, if it can be made in the shop, is generally eagerly accepted. This is good neither for the individual nor for the industry.

Individually in most cases, and certainly collectively, we should spend more money in developing the demand for the apparatus we manufacture. Just what this amount should be, expressed in percentage of invested capital, business done or otherwise, is a question so debatable that its decision should not be undertaken now. It might well receive consideration from a committee which would collect statistics for those who would like to be guided but who do not have confidence in the advertising profession and their own ability to establish a budget.

SALES MUST BE DEVELOPED

This development effort should not by any means be confined to trade papers, circulars and the various forms of advertising, but rather a healthy proportion of the total should be used to defray the salary and expenses of well-trained sales engineers who have not progressed to the point where they believe it beneath their dignity to attempt to convince the owner of a gas engine that it is worth while to send it farther out into the country and install a motor, or to attempt to influence the installation of electric drills in the shops and similar matters. And some effort should also be spent on development within our works of new models, designs, types of apparatus, etc.

Another form of development which can be undertaken with results varying with the determination and continuity of purpose put forth is to increase the number of machinery manufacturers who foster the sale of motor-driven units. Well-directed efforts will produce results that will surprise those who have not systematically tried this plan. But when developing such business, or when approached by the manufacturer already convinced, we should remember that the trade in the majority of cases, and the user in every case, is relying upon the manufacturer of electrical apparatus to supply him with the right kind and type of apparatus, and particularly must it be of such capacity that his requirements will be satisfied.

LET ENGINEERING STANDARDS GUIDE SALES

Our business policy should be sufficiently definite to cause us to refuse business when it is plain to us that results will not accrue in keeping with what the relying public expects, and particularly when it is apparent that our nameplate is the part of the products of our works that is most desired by the machinery manufacturer buying for resale. Whenever results of an inferior character have come from the operation of the products of works which have not been guided by the proper engineering and commercial standards, the reputations of all manufacturers of similar apparatus have suffered. And we must, when building for the future, build the product of our works in the way that will best meet the conditions surrounding or forming a part of the installation from the standpoints of safety to person and fire prevention. Individually we cannot afford to attempt to dodge this responsibility.

Records to which you have access show that there were 1,030 electrical apparatus and supply manufacturers in 1914, with a product valued at $335,000,000, and that this number had increased nearly 40 per cent,

*Address at recent meeting of Electric Power Club in Cleveland, Ohio.

or to 1,403, in 1919, with a product valued at $884,000,000. A great majority of these manufacturers should be so classified as to suggest that they be members of the Associated Manufacturers of Electrical Supplies. We sincerely trust they will become susceptible to the influence of that association. We are interested indirectly because their policies and acts definitely influence public opinion toward the electrical industry. But the Electric Power Club has numbered among its membership a majority of all electrical apparatus manufacturers, who manufacture, no doubt, more than 85 per cent of the product coming within the scope of the Electric Power Club activities. While these figures may not be generally known, I believe it is a generally accepted fact that the club represents the apparatus industry, and because its designing, laboratory and commercial engineering staffs are so large, the Electric Power Club and its individual members are expected by other accepted representative bodies to see that proper rules are compiled and adopted and in turn recommended to those charged with the responsibility of inspection, for the protection of the public, in all that appertains to safety to person and fire prevention.

Insuring Safety from Accident and Fire

Since this is considered our duty, and the formation and maintenance of this club is evidence that we have acknowledged responsibility for it, let us make up our minds to discharge it promptly. Let us set about it, if possible, by individually interesting ourselves in the matter and pressing to a conclusion a co-ordination of decisions as to what is best for all interested. The channels through which we work, our safety standardization committee and fire prevention committee, should represent, not the conclusion of the committees only, but the conclusions of our membership as a whole. Rules which read "should be" are worse than none in the hands of one whose actions are susceptible to influence. Such rules should read "must" or be so defined as to leave no room for doubt. If rules are not clear, we may expect fully as much trouble to be caused us by our own salesmen as by the inspectors and others.

The work being done by such organizations as the American Engineering Standards Committee, the International Electrotechnical Commission, the American Institute of Electrical Engineers and the National Electric Light Association is of substantial interest to us.

Standardization Must Be Pushed

Individual users of our products, associations and engineering bodies and the representative of other industries and professions alike expect the Electric Power Club to establish standards for the guidance of its members, and particularly for those not members, that apparatus may be purchased on an economical basis, and with reasonable assurance of fair value received, when the Electric Power Club rules are used as a guide, and with the hope that through such guidance apparatus of decidedly inferior quality may gradually disappear. We, as Electric Power Club members, have, as is evidenced by the handbook, accomplished a substantial amount in the way of standardization. But there is more to be done, particularly in the matter of commercial standards. Some standards for future design might well be considered as deserving to be dignified by adoption as standard and put in the handbook.

I submit for your earnest consideration the adoption of a resolution, if necessary, and in any event the authorization of your various sections to compile and print on colored paper for insertion in the handbook some of the suggested standards which failed of adoption and therefore are now frowned upon by the Electric Power Club. There seems to be a real need for this. Some member companies are apparently making little, if any, effort to observe the adopted standards of the club, while others have, since standards have been adopted, placed apparatus upon the market definitely opposed to these standards, and in other cases have violated the spirit of the rules as a whole. This is a situation which cannot longer be ignored if we are to accomplish for the public and ourselves those things for which the Electric Power Club stands. While the Electric Power Club should diplomatically endeavor to increase its membership, I do not believe its interests will be best served by electing to membership those who are not prepared to accept its adopted standards.

We might with propriety teach our sales organization that we are not offering for sale terms and conditions, but apparatus which carries a distinct value, probably a greater percentage of value than anything else in the apparatus line that is found in the market, and that we are trying to sell it on such a basis as will give us a profit and enable us to render some service that is necessary along with it. We should make plain that our organization wants to protect the reputation of electrical apparatus as a whole by finding some way to avoid supplying it to those who desire to purchase it for resale under conditions of service which prevent the accrual of the best results, or to sell it under conditions where the nameplate will deceive those charged with the responsibility of its installation and those contracting to supply the energy for it. There are any number of flagrant abuses of confidence by practices of these kinds. And further we should try to aid our commercial organizations to improve their methods of transacting business in that positive way which is customary in many other lines of trade. In other words, when an order is placed with the manufacturer of electrical apparatus, the customer should understand that he has definitely bought something, not merely obtained a place on the manufacturer's schedule, and that we have not in the last analysis agreed to carry apparatus in stock for him. And I believe from observation and from conversation with manufacturers that much good would come to our industry and to ourselves individually if we would be a little more definite in our instructions to our sales organizations by telling them what we will and will not do and buy. Then through the sales organizations we should commence to convince the trade that standard "off-the-shelf" goods are better than something special.

New North American Junior Financing

THE stockholders of the North American Company last week received the privilege of subscribing at par to additional common stock in the total amount of $10,422,400 par value. Of this amount $2,233,350, or 15 per cent, is to be subscribed for on or before Jan. 3, 1922; $2,977,850, or 20 per cent, on or before Dec. 30, 1922; an additional 20 per cent on or before June 30, 1923, and an additional 15 per cent on or before Dec. 31, 1923. In this way the plan for providing for requirements of subsidiaries through junior rather than major financing is effected.

Ornamental Street Lighting*

High-Efficiency Gas-Filled Lamps on Series Circuits Are Becoming Common—Considerations to Be Remembered When Installing "White Way" for Business, Park and Residence Streets

By L. A. S. WOOD

Manager Illuminating Section, Westinghouse Electric & Manufacturing Company, George Cutter Works, South Bend, Ind.

THE first requirement of an ornamental street-lighting system is that, while efficiently illuminating the streets during the hours of darkness, it should be inconspicuous in the daytime, blending harmoniously with the architecture of the surrounding buildings. Provision should be made in the lighting units to direct the light emitted above the horizontal to the plane of illumination, but it is desirable that a small amount of light from the upper hemisphere should be directed against the fronts of adjacent buildings.

Glare, within the range of vision of the pedestrian or vehicle driver, should always be avoided. Another important requirement of good street lighting is that the intensity of illumination should be graduated in accordance with the conditions of the various localities. An ornamental street-lighting system should be considered as part of a plan to beautify the city as a whole and not as a means of advertising one section, perhaps to the detriment of some other locality.

CLASSIFICATION OF STREETS FOR ORNAMENTAL LIGHTING

In many of the larger cities some exceptionally wide and important streets will be found which will require special treatment. In general, however, for the purpose of determining the correct size of lamp with the best spacing and mounting height, the streets may be divided into three classes. Important business streets, side streets and residence streets. The following table gives approximate data on this subject, which, however, may be varied to meet local requirements:

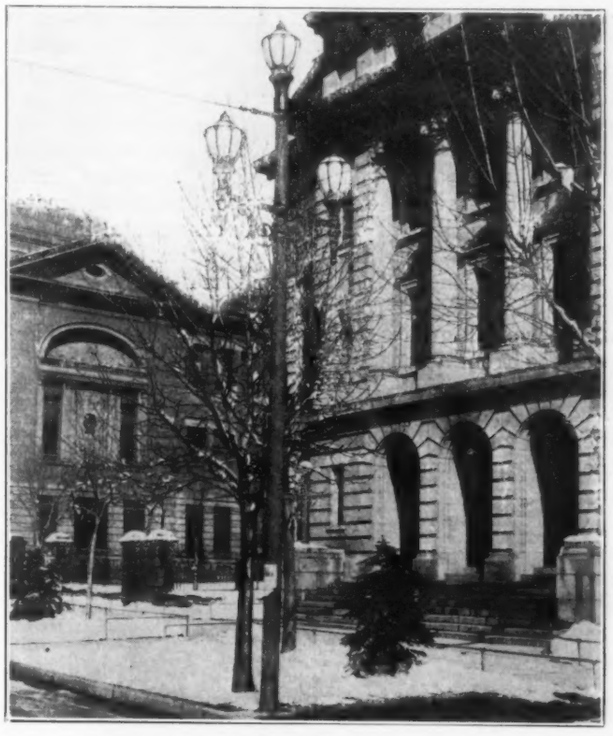
Type of Street	Size of Lamp in Lumens	Spacing in Feet	Mounting Height in Feet
Important business	6,000 to 15,000	50 to 75	12.5 to 15
Side	2,500 to 4,000	75 to 100	11.5 to 13.5
Residence	1,000 to 2,500	150 to 250	10.6

In the important business streets and side streets the ornamental posts should be set symmetrically opposite each other on either side of the street, while in residence districts the posts should be staggered. For exceptionally wide and important streets a greater intensity of illumination is required, with higher mounting, and for this purpose two-light ornamental posts, for use with 15,000-lumen and 25,000-lumen lamps, have been developed.

Owing to its flexibility, the "Mazda C" lamp is peculiarly adapted to ornamental street lighting, and when operated on a constant-current series system it affords an efficient and economical unit, easily installed and

*Features of discussion presented before American Society for Municipal Improvements.

†The series "Mazda" lamp is now rated in lumens instead of candlepower, and the lumen rating is ten times the present candlepower rating.



LIGHT STANDARD SERVES AS TROLLEY-WIRE SUPPORT

controlled, giving a range of from 600 lumens† (60 cp.) to 25,000 lumens (2,500 cp.). Any size of lamp within this range may be operated in series on the same circuit without changes in the regulating equipment at the central station, and with suitable inclosing glassware a soft diffused illumination or a brilliant sparkling light without glare may be obtained.

CONSTANT-CURRENT SERIES CIRCUITS

Series incandescent lamps have been made for some time in ranges of from 60 cp. to 1,000 cp., but the larger size of lamps did not come into commercial use until the high efficiency "Mazda C" lamps, operating at 15 amp. and 20 amp., were introduced. These lamps, owing to the large size and rugged construction of the filament, are well adapted for ornamental street-lighting systems, except in residence districts. Since the standard rating of series alternating-current circuits is either

SIZES OF HIGH-EFFICIENCY "MAZDA C" LAMPS

Lumens‡	Amp.	Average Volts	Watts	Light Center, Length, In.
4,000	15	14.9	223.5	9.5
6,000	20	15.5	310	9.5
10,000	20	25.9	518	9.5
15,000	20	37.6	752	9.5
25,000	20	60.7	1,214	9.5

‡The nominal candlepower of these lamps is one-tenth their lumen rating.

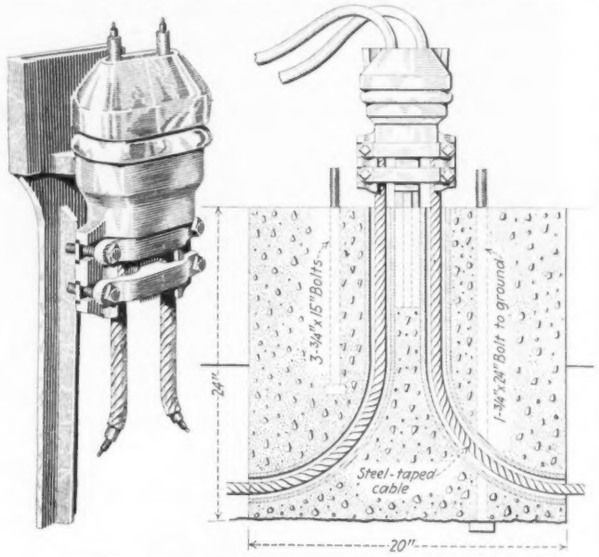
6.6-amp. or 7.5-amp., individual auto-transformers to step up from the line current to that required by the lamp have been designed, and these are generally mounted in the post top, immediately below the socket. In cases where a safety coil is installed in the base of the post, the auto-transformer is omitted and the safety coil serves as the step-up transformer.

The regulating equipment generally consists of moving-coil constant-current transformers and control panels, which limit the current in the circuits, safeguarding the lamps against surges and, at the same time, insuring that sufficient current will flow through the lamps at all times to maintain the rated candlepower. In addition, regulating transformers have been designed for mounting on poles in a high-tension distribution network, thus permitting an ornamental lighting system to be connected to a high-tension line without the necessity of running special lighting circuits back to the substation. This improvement in regulating apparatus, which allows operation from either a time switch or a remote-control device, materially reduces the cost of installing ornamental lighting systems at a distance from the substation.

Another method of control for series "Mazda" lighting is the reactance-socket system. This is generally used for small groups of lighting units. The lamps are operated from a constant-potential transformer with a reactance coil connected in parallel with each socket. When a lamp burns out the current is forced through the reactance coil, which introduces an impedance in the line equivalent to that of the lamp, thus maintaining the current constant.

Until the introduction of steel-armored and lead-covered cable it was customary to lay underground cable in conduit, but modern practice favors the use of steel-armored cable buried in a shallow trench below the curb or in the parkway. The steel-armored cable consists of a copper conductor (usually of No. 8 gage) insulated with rubber, over which is a braided cover and jute filling. A layer of tape is then wrapped around, and this is inclosed in a continuous lead sheath covered with a coating of tarred jute. Around this are wrapped two layers of steel tape so arranged as to insure the steel cover overlapping when the cable is bent. A serving of jute is placed around the cable and affords protection to the steel tape when placed in the ground. If properly installed, the life of this cable is almost indefinite, as the lead cover forms an efficient protection from water, while the steel armor protects the cable from mechanical injury. The posts are usually wired with rubber-covered and braided cable.

EFFECTIVE POST INSTALLED IN GRANT PARK, CHICAGO



CABLE AND POTHEAD FOR BASE OF ORNAMENTAL LIGHTING POSTS

It is important that ends of the cable, where cut, should not be exposed to the weather. A loop should be left at each post sufficiently long to reach the terminal of the disconnecting device in the base of the post, and cement is poured around the loop to form the foundation for the post. This is a more satisfactory method than the one usually used of making the post foundations first with the conduit elbows for the cable to be drawn through, as it leaves the cable intact until the time the connections are made in the base of the post. A disconnecting pothead should be used in the base of the post, and this should be of such design as to seal the ends of the cable and bond and ground the steel armor and lead cover. The accompanying drawing shows a good example. It should also be designed so that if the post is broken the post wiring is automatically disconnected from the underground system and the circuit in the base of the post is re-established by a short-circuiting device. It is desirable that a clamp be used in the top of the post for relieving the terminals of the lamp socket from the weight of the cable.

In the constant-current series system of operation the high-tension current is usually carried up the post, and, although when properly installed this is not objectionable, several cities have preferred to use a safety coil in the base of the post so that a voltage equivalent to the voltage of the lamp only is carried up the post. Safety coils have been designed equipped with disconnecting potheads.

Occasionally, in the interests of economy, it is found desirable to decrease the illumination on the streets

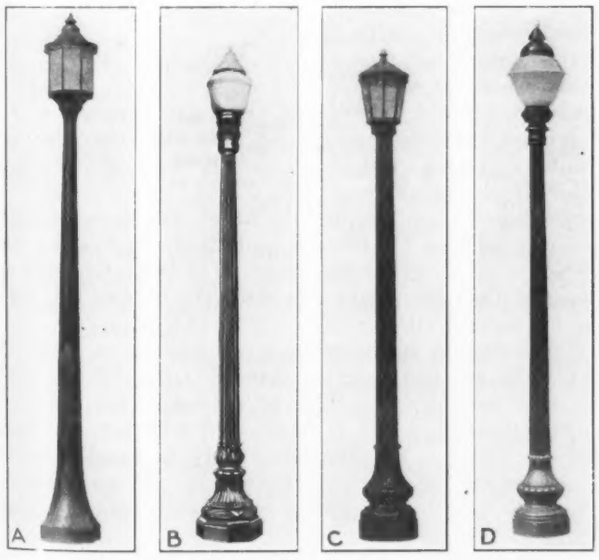
after midnight when only protective lighting is required. This is best accomplished by dividing the lighting system into two circuits, one operating the "all-night" lamps and one operating the "part-night" lamps. For this purpose two single-conductor cables may be laid in the same trench, connecting with alternate lamps or in any other combination that may be desired. If preferred, a twin-conductor cable may be used.

Since the introduction of the high-efficiency "Mazda C" incandescent lamp, the single-light post equipped to distribute and direct the light on the plane of illumination has grown in popularity. Cast-iron posts will not corrode; neither will they chip or crack under extremes of temperature. They are designed to withstand severe shocks, such as might be received in ordinary street traffic, and present the slender and graceful appearance so desirable in ornamental street-lighting units. It is the writer's observation that concrete posts, unless manufactured with the greatest care, will chip and crack in Northern climates. Pressed-steel posts present a massive appearance, but a good grade must be selected in order to avoid their being dented and bent by any shock to which they may be subjected.

USE OF TROLLEY POLES AS LIGHTING POSTS

On streets where trolley poles are in service the best method of lighting is by the use of ornamental trolley brackets with suitable lighting units, either with single or double arm, which may be attached to the trolley poles, presenting a very attractive appearance and eliminating the necessity of cluttering up the streets with additional posts. (See accompanying illustration on page 1223.)

Another method of adapting trolley poles as ornamental lighting units is to incase the pole in an ornamental cast-iron shell with ornamental brackets attached. An attractive unit has been designed with double brackets immediately below the trolley span wire and a single light at the top. The span wire is attached to the trolley pole through a hole provided in the capital of the top lighting unit.



FOUR SINGLE-LIGHT STANDARDS OF PLEASING PROPORTIONS

A—Arcadian post and colonial lantern for residential and park sections. B—Ornamental design for commercial sections. C—Continental post with octagonal lantern. D—Colony post with refractor top.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Engineering Catalogs for European Technical Schools

To the Editors of the ELECTRICAL WORLD:

During the past few months I have become intimately acquainted with Norwegian engineers and student engineers while investigating the hydro-electric possibilities and developments of Norway. Their attitude toward American engineers is a most interesting one, and at times I do not know whether to feel amused over the situation or to take it seriously. In brief it can be stated as follows: American engineers are ultra-practical but lacking in theory; they first construct and then fit the theory to the result. When student engineers compare European apparatus with American, they seem to choose the old and partly obsolete American types, partly because they do not know of the newer types and partly because somebody has been here first (from German firms) and told them that the apparatus was poor.

One professor of hydraulic design who spent a year in America fifteen or twenty years ago told me that the Americans did not know how to build turbines until they copied European methods. I suggested to an instructor in electric transmission that he might mention aluminum cells in connection with his horn gaps and he told me they were not any good. Interested, I questioned, "Why?" "Because Professor —— [I do not remember the name of the German professor or engineer] swears up and down that they aren't." And that settled it.

And so it is every time we discuss the relative merits of American and European products. The attitude is probably typical not only of Norway but of many other countries. It is not altogether surprising that German commercial propaganda has such a firm root here, first on account of the similarity of the languages, making it easier for the Norwegian to learn German, and secondly, on account of the physical proximity of the two countries. In the drafting room where the Norwegian student designs his machines, his power stations and his transmission lines one finds stacks of German catalogs and price lists. He lives in an atmosphere of German engineering, and when he gets out there is no doubt that he will put in German machines and supplies similar to those he worked out on paper back at college. But, worst of all, he grows up under the impression that American engineers are inferior to the German. Granted that foreign exchange is far from being in our favor in foreign markets, what is far worse is the lack of confidence in the American engineer. The former difficulty will right itself in time; the latter, with German encouragement, will continue to grow worse unless some steps are taken further to acquaint the young engineer with American products.

It occurred to me that, in case you deem it a worthy cause, you could bring the matter to the attention of

prominent manufacturers who would be willing to donate literature for a little American propaganda. It could be addressed as follows: "Head of Department of [Electrical, Mechanical, etc.] Engineering, Norges Tekniske Hoiskole, Trondhjem, Norway." It would be well to address a note stating that the literature is sent for the use of graduate and student engineers; or, the writer would be glad to take charge of its distribution.

Personally, I think a worldwide distribution of such literature in engineering schools would in another generation materially aid America's foreign market—or, better still, increase foreign good will, when the market would take care of itself.

C. N. ANDERSON,
Fellow American-Scandinavian Foundation.
Norge-America Fondet, N. A. L. Building,
Christiania, Norway.

Analysis of Costs by Industrial Meters

To the Editors of the ELECTRICAL WORLD:

Nothing in the operation of a large industrial plant is more important than the accurate knowledge of costs and their proper apportionment among the various divisions of the plant. The electric power costs are easily determined by means of meters so placed as to split up the power consumption to any extent desired. If properly installed and adjusted, these meters not only apportion costs but furnish an excellent check on the accuracy of the power company's totalizing meter. Any discrepancy will be noted as soon as it occurs, and meter trouble can be corrected in time to avoid the difficulty usually encountered in attempting to adjust a back bill.

The object just named is often attained by installing one check meter, which with its accessories is a complete duplicate of the supply meter. Under normal conditions, however, the well-known reliability of the modern watt-hour meter insures that the two meters will run side by side for long periods without material variation, and the check meter has no other use than that of detecting a discrepancy which may never exist.

Unfortunately, the specialized knowledge necessary to install and maintain an electric meter properly is rarely found on the electrical staff of an industrial concern. The result of such conditions may be illustrated by a case recently brought to the writer's attention. The management of a large plant had reason to question the accuracy of its meters and asked the meter department of the power company to test them. The results of the test were rather surprising. Some of the meters were of the self-contained type, some were installed with current transformers, and others had both current and potential transformers. In the two classes last named not one meter was found connected correctly, leads being reversed and the current and potential coils of the same meter element connected to different phases. Every meter showed forward rotation on its normal load, this evidently having been taken as the criterion of proper connection. However, the erratic registration under such conditions may well be imagined. The self-contained meters were properly connected, but several were operating on extremely low power factors and were quite slow on account of having been originally calibrated in the factory for a higher frequency than that of the system on which they were operating.

In addition to rectifying connections and properly adjusting the meters, the power company was enabled to make some recommendations of advantage to both parties in the matter of reducing size of motors and improving power factor.

The central station has usually the best facilities available for the installation and periodic testing of meters, and the consumer will do well to take advantage of this. In view of the mutual benefit involved, it will be possible in most cases to have the work done on a basis of actual cost.

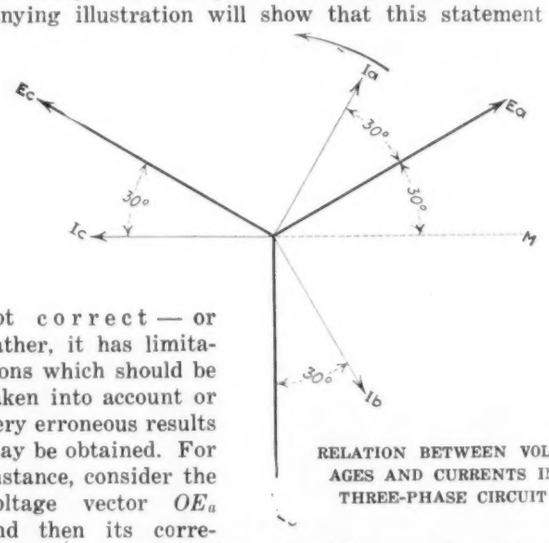
HALBERT R. THOMAS,
Testing and Meter Department.
Southern California Edison Company, Los Angeles.

Checking Connection of Power-Directional Relays

To the Editors of the ELECTRICAL WORLD:

When installing power-directional relays it is often recommended that the potential be connected to the proper phase so that the current will lead by 30 deg. at 100 per cent line power factor. One of the methods described in various magazine articles and engineering society reports is to use a single-phase wattmeter with the current coil in series with the current coil of the relay and pick out the pair of voltage leads which give the highest reading "with a lagging-load power factor."

A study of the simple vector diagram in the accompanying illustration will show that this statement is not correct — or rather, it has limitations which should be taken into account or very erroneous results may be obtained. For instance, consider the voltage vector OE_a and then its corresponding current vector OI_a which are shown in the correct relation for 100 per cent line power factor. It is quite evident that the reaction of these two will be greater than the reaction between the current OI_a with either voltage OE_b or OE_c.



RELATION BETWEEN VOLTAGES AND CURRENTS IN THREE-PHASE CIRCUIT

Now should the current start lagging it will still give the greatest reaction between OE_a and OI_a until it lags to line OM. This is a 60-deg. lag from its original position and is produced by 50 per cent load power factor. At this point there is equal reaction between $OI_a \times OE_a$ and $OI_a \times OE_c$, and any further lag will result in a higher wattmeter reading being produced by the voltage OE_c.

Assuming the original 100 per cent line power factor, the reaction between OI_a and OE_a is the same as between OI_a and OE_b, while if current starts leading, the reaction between OI_a and OI_b will increase while that between OI_a and OE_a will decrease.

This shows that the wattmeter method applies only when the load power factor is between 100 per cent and 50 per cent lag. Consequently great care must be used in selecting the proper voltage leads for power-directional relays when the power factor is either leading or is lagging below 50 per cent.

V. H. TODD.
Summit, N. J.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Floodlighting Highly Successful in Dusty Industrial Plant

SOME time ago there was considerable discussion in the ELECTRICAL WORLD relative to the methods best adapted to lighting areas exposed to floating dust or lint caused by manufacturing operations. Obviously the ideal requirements of a system of lighting under such conditions are, adequate illumination with a minimum of installation expense, ease of cleaning bulbs and fixtures and economical upkeep.

If we analyze carefully the cost of cleaning lighting equipment, we find that the primary factors are the number of units, the time consumed in cleaning and the supplies necessary for the work. The factor of time may be subdivided further and the essential divisions classified in accordance with the answers to the following questions: Is the lighting unit easily accessible? Is it necessary to take down the fixture or any part of it for satisfactory cleaning? Can the bulb be cleaned without removal? Is it necessary to cut the unit out of service during the cleaning operation? What special equipment or materials must be used to remove the accumulations of dust and dirt quickly and cheaply? Can the work be done during the operating hours in a busy industrial plant? Is it possible to utilize spare labor in the cleaning or must special employees be retained who will devote all of their time to that particular purpose?

Bearing the answers to these questions in mind, the system which would most nearly conform to our ideal would of necessity have the following characteristics: It would consist of a minimum number of units of standard construction; it could be cleaned quickly and simply without removing either bulb or fixture and without cutting the lamp out of circuit; it would require neither special equipment nor expensive supplies in the cleaning operation.

These requirements lead us inevitably to the inclosed floodlight, provided that suitable illumination can be obtained from such a unit and can be adapted to the many varying conditions of industrial-plant lighting. In many instances it has been proved by experience that the problem can be solved in a highly satisfactory manner by the use of such equipment.

The writer installed and placed in operation a short time ago a system based in a general way on an analysis similar to that just outlined, and the results have more than justified the most sanguine expectations. The plant to be lighted was a woodworking shop in which there was a continual cloud of dust arising from the machines, and it was essential that a high illumination be secured on the working plane and on the feed rolls and cutting tools of the various machines doing exact or particular work. Three sizes of floodlamps were used—250, 500 and 1,000-watt. In addition, three types of reflectors, wide-angle, standard and concentrating, were found necessary to meet various conditions. But even this equipment did not exactly fit certain conditions, and it was found advisable to use lenses of opalescent and diffusing prismatic glass in addition to plain lenses.

After suitable locations were decided upon by careful measurements and actual observation, a trial was made of the unit most nearly meeting the theoretical conditions with each size of bulb. If the results were not satisfactory, the reflector or lens was changed until the illumination was correct. The tests were effected by using a floodlamp with a long extension cord and a full equipment of lenses and reflectors. Of course, all the trials were made at night when results could be accurately checked. If necessary, locations, bulbs, reflectors or lenses were changed until the light was of suitable intensity and quality for the particular conditions to be met. Thus, if it became necessary to place a unit very close to a given working plane, the small-size floodlamp was installed and equipped with wide-angle or diffusing fittings. Other units located by necessity at a distance from the working plane or area to be lighted were fitted with concentrating reflectors. In most instances the units were placed so that the rays came to the plane at an angle of 20 deg. to 30 deg. from the horizontal, although an angle of 45 deg. or even 60 deg. was used in specific cases. To increase still further the over-all efficiency of the lighting the interior of the plan was finished in a waterproof flat white paint.

RESULTS OF OPERATION VERY SATISFACTORY

The results actually attained by this method of lighting were high illumination at the exact points where most light was needed, splendid general illumination from diffusion and dispersion aided by the reflecting surface of the interior, and entire absence of glare. The fixtures could be cleaned in ten minutes by simply wiping each lens with a damp cloth. The wiring and control circuits were much simplified in comparison with any general lighting scheme, as comparatively few units were needed to light even large areas. Breakage of bulbs was reduced materially and theft obviated. The cost of such a system appears to be slightly less than that of any other method of lighting furnishing the same amount and quality of lighting service for such special conditions.

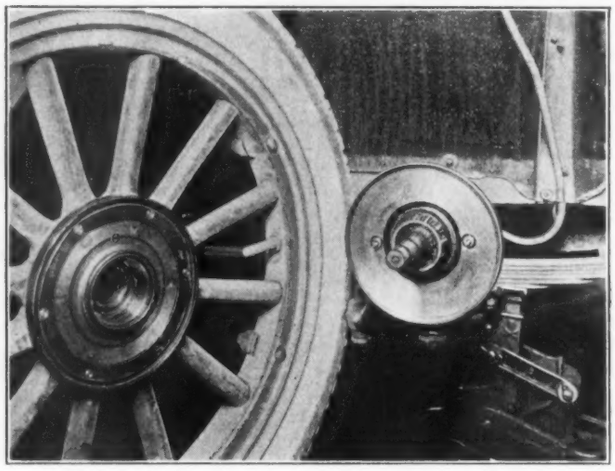
By comparing this installation with others it appears to the writer that this method of shop lighting, especially in dusty locations, will solve many illumination problems if due attention be given to the general design of the layout and to the choice of suitable reflectors and lens equipment for the various fixtures. The one point to bear in mind when designing a system along these lines is that the location, size and equipment of each lighting unit is a problem in itself to be worked out for the specific conditions under which it is to operate.

D. R. SHEARER.

Johnson City, Tenn.

Quick Measurements for Pole-Line Extensions Made in Automobile

LAYING out, estimating and staking pole-line extensions requires fairly accurate measurement of distances along highways and alleys. Such measurements, when made with a tape line, require considerable time and the services of two men. If it is attempted to use an automobile, the trip record of the speedometer is not found satisfactory because of the difficulty in reading distances less than one-tenth of a mile. Lost motion in the driving mechanism also causes considerable error in measuring short distances. In an attempt to develop some accurate and rapid means of measuring



CONTACTS ON AUTOMOBILE WHEEL OPERATE COUNTER FOR MEASURING DISTANCES

distances the following attachment to an automobile has proved satisfactory. A counter, mounted on the instrument board of the car, is operated electrically by an interrupting device attached to the front wheel. Energy required to operate the counter is obtained from the storage battery in the car. A switch mounted on the instrument board, near the counter, serves to open the circuit when the device is not in use. Combined with the switch is a contact button by means of which the counter may be quickly set at the beginning of each measurement. The device operates successfully at any speed less than 25 miles an hour.

The interrupter is made up of two small stationary brushes in contact with a revolving surface fixed to the wheel. Insulated segments set in the part attached to the wheel interrupt the circuit through the counter magnet as they pass over the brushes. The parts attached to the wheel are entirely inclosed to protect them from mud and dust, and the interior is partly filled with grease similar to that used in the wheel bearings. Wires leading up from the interrupter to the instrument board are inclosed in flexible conduit. The interrupter is arranged to count half revolutions of the wheel for laying out pole-line extensions, each count representing approximately 4 ft. For use in making preliminary surveys for underground street lighting the interrupter has been arranged to count four times per revolution.

Since the device records revolutions of the wheel, it is necessary to interpret the result in feet by means of a correction factor or by a reference table. It has been found, however, that in practice any one using the counter regularly eliminates the necessity for such interpretation by using as a unit the distance represented by one count. In this way only a portion of the field record need be converted to feet. A 32-in. x 4-in. nonskid tire has a rolling circumference when properly inflated of 8.38 ft. With an interrupter counting half revolutions one count would represent a distance traveled of 4.19 ft. If it is desired to lay out a pole line having thirty poles to the mile, it is only necessary to run the distance required to register forty-two counts between pole locations. If for any reason it is necessary to space any of the poles more or less than the average 176 ft., it is necessary only to note the number of counts more or less than forty-two and multiply by 4.19 to know the exact amount of variation. Ordinarily, multiplication by 4 is sufficiently accurate, since the error is effective only in the number of counts variation, which in most cases would not be more than five counts (20 ft.) more or less than the average of forty-two. Similarly thirty-five poles to the mile (150-ft. spans) average thirty-six counts per span. Variations in air pressure in the tire within limits not injurious to the tire do not introduce an error large enough to be considered. As the tread of the tire wears down its rolling circumference gradually becomes smaller. This error is also small enough to be neglected except for very accurate work. The distance represented by one count is easily checked by running a known distance with the counter on. Ordinarily half a mile is sufficient, but a very accurate check may be obtained by increasing the distance run to 2 miles or 3 miles.

The device might be used for other engineering work, such as preliminary surveys of highway improvement projects, or of water-pipe or gas-pipe line extensions, or surveys for appraisals, etc. In all such work it should save time and labor.

N. L. DOLPH,
Distribution Engineering Department.
Detroit Edison Company,
Detroit, Mich.

Lessons Learned from Forty Electrical Fatalities

WRITING under the above heading in the *Safety Bulletin* issued by the Bureau of Safety, Chicago, E. S. Whiting, assistant chief engineer of the Liberty Mutual Insurance Company, dwells on the too frequent occurrence of fatal shocks with the low voltages ordinarily considered safe. It is undoubtedly, he says, the amount of current sent through the body and the time it flows that cause the death, but there is no way of tying the voltage and the current together quantitatively in shock cases, because the resistance of the shock circuit is widely variable, contacts ranging from a light finger contact where the shoes are perfectly dry to a heavy grip on a switch blade with the feet in water.

The remedy for such hazards lies, Mr. Whiting holds, in complete inclosure of all current-carrying or live parts of the wiring and equipment to at least 7 ft. above floor level. All fuse cut-outs should be boxed in; bare motor terminals should be boxed in or thoroughly insulated with compound and tape; inclosed or "dead-front" switches should be substituted for open-knife switches; all open wiring should be out of reach; drop cords should be avoided; only porcelain or weather-proof lamp sockets, without keys and controlled by wall switches, should be used; the live base on each lamp should be completely covered by its socket, and if extension cords have to be used, the highest grade of rein-

forced cords with lamps mounted on wooden handles with cages and porcelain sockets should be provided. Finally, all dead metal parts of low-tension equipment should be permanently grounded, including conduit, cable sheaths, switch boxes, compensator and transformer cases, motor frames and switchboard frames. The National Electrical Code, Mr. Whiting thinks, is too lenient in this respect, as it makes only the grounding of conduit compulsory, other dead metal parts being left to the option of the wiring contractor.

Coming to high-voltage shock hazards, Mr. Whiting thinks that the engineers who design the layout of high-tension stations sometimes give too much weight to the fact that only expert operators will be exposed to the equipment. He recalls cases where the designer omitted guards from 11,000-volt bus compartments, although the bare wiring reached down to floor level and within a few inches of the aisle in which the operator had to walk; where switch blades when open stuck out beyond the barrier walls; where a grounding terminal was placed at the back of a compartment containing live wires; where charging cords for arresters were placed close to live choke coils, and where the switches were crowded into such a narrow aisle that the operator pulling one of them might thrust his elbow into live parts behind him. No possible justification for creating these hazards can, in Mr. Whiting's opinion, be found. They are major, not minor ones—a matter of life or death—and, however skillful and careful the operators may be, no man is immune from slipping or losing his balance.

Connecting Overhead Circuits to Underground Cables

A DISCUSSION of reinforcing the insulation on cable where it is joined to an overhead high-voltage line was embodied in an article by A. A. Meyer in the ELECTRICAL WORLD for May 21, 1921, page 1151. In this connection the writer has just received some interesting information on the same problem from Vienna.

Mr. Meyer in his article pointed out that at points where a high-voltage overhead line joins an underground lead-covered cable punctures due to lightning disturbances occur frequently. This is due to the fact that such disturbances, which are usually of a very much higher frequency than the normal frequency of the line, find the capacity of a lead-covered cable so high that they can penetrate it only for a short length (about 200 ft.), after which they obtain relief by puncturing the cable. The author suggested and actually built such a cable line with reinforced ends—that is, he spliced to the regular (three-conductor) cable at the ends three single-conductor cables having a very much heavier insulation than the triple-conductor cable. No lightning arresters were installed, and for the short period of about five months no troubles occurred.

The writer has just received a communication from Vienna, dated Oct. 21, 1921, from the Felten & Guilleaume Company, stating that this concern has built since 1908 several cable lines with a protection as described by Mr. Meyer for voltages as high as 35,000. This cable protection is covered by German patent 222,843 of Jan. 30, 1908; by Austrian patent 42,111 of May 10, 1910, and by Hungarian patent 51,093 of March 5, 1910.

Mr. Meyer says in his article that he determined the necessary amount of increased insulation in a "somewhat experimental" way, but the Austrian patent mentioned contains the exact mathematical procedure to select the proper thickness of insulation on the reinforced cable ends. The Austrian inventors also advocate that the reinforcement be graded so as to join the main cable to two, three or more differently graded, more heavily insulated cable sections at the two ends, and to ground dependably the lead sheath and all the metallic junction boxes. It is interesting to note that the inventors increase the capacity of the ends of the reinforced cable sections by increasing the diameter of the conductor. To avoid increasing the cross-section at the same time they employ hollow conductors in the end cables, resulting in a uniform copper cross-section for the whole cable. The claim covers single-conductor cables as well as concentric cables of two and more conductors.

A. PALME.

Pittsfield, Mass.

Conductor Sizes Determined by Modified Kelvin's Law

BY KELVIN'S law there is a definite size of wire which must be installed in a given circuit if the maximum economy is to be realized. A larger wire will entail too great interest and depreciation charges, while a smaller size will raise the total cost per annum on account of the greater amount of power lost. This law has served as a basis for calculating economical size of conductors for transmission and distribution systems for many years, but modifications are required for its practical application. Two phases of the problem are discussed in this paper—(1) the determination of average power loss from a study of the load characteristics and (2) the selection of the correct constants to be used with various insulated wires.

There is a simple relation between the value of energy, the annual fixed charges on copper and the mean current in amperes which determines the economic size for any given case. This problem of economic size is quite apart from questions of regulation, mechanical strength or safe carrying capacity, but it deserves equal consideration. Kelvin's law states that the size of wire which is most economical is that on which the fixed charges per annum are equal in amount to the value of the power lost per annum. If the expressions for annual fixed charges (dollars) and for value of annual power loss are equated the formula for economic size results. In this the only variables are the current assumed, the value of power, the cost of copper and the fixed charges on investment.

In a three-phase circuit the power loss in kilowatts is $3RI^2/1{,}000$. To get the annual loss we must find the current corresponding to an average loss throughout the year. Since loss varies as the square of the current the average loss depends on the average square and may be found by squaring values of current at stated time intervals, averaging the squares and extracting the square root, a process too tedious to be of practical use. With a given type of load there is, however, a fairly constant relation between the loss at average load and the actual loss. A check of a number of load curves for residence lighting in Seattle gave a ratio of actual loss to loss at average load varying from 1.30 to 1.49, averaging 1.39. These curves had load factors from 14 to 27 per cent. Curves for system

load, showing 50 per cent to 62 per cent load factor, gave a ratio from 1.17 to 1.33, averagnig 1.23. This "loss factor" should be investigated for unusual load curves. For distributing circuits the factor 1.39 will probably be as close as the estimation of average load.

Average loss in kilowatts, then, is $3RI^2l/1{,}000$, where I is average current, amperes; l is loss factor, as above, and yearly loss, in kilowatt-hours, is

$$(8{,}760 \times 3RI^2l)/1{,}000 = 26.28RI^2l.$$

The value of this power at p cents per kilowatt-hour is, in dollars,

$$26.28RI^2lp/100 = 0.2628RI^2lp \qquad (1)$$

where p is the value of energy (cents per kilowatt-hour) delivered to the circuit.

Yearly fixed charges in dollars are:

$$3w(f/100)(c/100) = 0.0003wfc, \qquad (2)$$

where w is weight of each wire in pounds, f is yearly fixed charges, interest plus depreciation expressed in per cent, and c is cost of wire in cents per pound.

To reduce this expression to terms of resistance rather than weight, note that the weight of a copper wire $(w) = 2{,}856R(\text{C.M.}^2)/10^{10}$, where R is resistance and C.M. circular mils of the wire.

Substituting in formula (2), yearly fixed charges, dollars:

$$\frac{0.0003 \times 2{,}856R\ (\text{C.M.}^2)\ fc}{10^{10}} = \frac{0.857R\ (\text{C.M.}^2)\ fc \qquad (3)}{10^{10}}$$

Equating (1) to (3), for a minimum,

$$0.2628\ RI^2lp = \frac{0.857R\ (\text{C. M.}^2)\ fc}{10^{10}},$$

whence

$$\text{C.M.} = 55{,}400\ I\sqrt{\frac{lp}{fc}} \qquad (4)$$

where C.M. is economic size wire, circular mils;

I is mean annual current carried;

l is loss factor, ratio of actual loss to loss at mean current;

p is value of power delivered to circuit, cents per kilowatt-hour;

f is annual fixed charges on wire, per cent;

c is cost of wire, cents per pound.

This formula applies to any circuit, single-phase, polyphase or direct-current. It may be noted that economic size is independent of voltage and length of line, except as the current is influenced by these factors.

For insulated wires the ratio of weight to resistance is higher, and the constant 55,400 will be lowered accordingly. Approximate constants for several standard insulations are given in the table following:

Wire	Constant
Bare copper, any size	55,400
Triple-braid weatherproof, No. 8 to No. 4/0	48,700
Triple-braid weatherproof, 250,000 circ.mil to 1,000,000 circ.mil	50,000
Double-braid rubber-covered, 0-600 volts, solid, No. 14 to No. 10	34,000
Double-braid rubber-covered, 0-600 volts, solid, No. 8 to No. 2	42,000
Double-braid rubber-covered, 0-600 volts, stranded, No. 4 to No. 00	44,400
Double-braid rubber-covered, 0-600 volts, stranded, No. 3/0 to 1,000,000 circ.mil	48,800

For insulated wires cost C will be actual price per pound of insulated wire.

FINDING ECONOMICAL SIZE OF DISTRIBUTION WIRES

1. As an example of the use of this formula consider a service for residence lighting using on an average 40 kw.-hr. per month at 120 volts, two-wire. The yearly consumption is 480 kw.-hr. and the average current is $480{,}000/(120 \times 8{,}760)$, or 0.46 amp.

The economic size, using loss factor of 1.39 and constant for small weatherproof wire of 48,700, with wire at 25 cents, energy at 4½ cents and fixed charges 10 per cent, is C. M. $= 48{,}000 \times 0.46\sqrt{\frac{1.39 \times 45}{10 \times 25}} = 3{,}542$ C. M., which is No. 15 wire.

2. Considering one of the branch circuits in the above residence, where No. 14 rubber-covered wire is ordinarily used, assuming the branch circuit to carry one-third the total, or 0.15 amp. average, energy at 5½ cents, wire at 30 cents and constant of 34,000 for small rubber-covered wire, one gets:

$$\text{C.M.} = 34{,}000 \times 0.15\sqrt{\frac{1.39 \times 5.5}{10 \times 30}} = 814\ \text{C.M.},$$

which is near a No. 20 wire.

3. Considering a power feeder for 3,000 hp. of motor load at 26,000 volts three-phase, with an average load of 1,200 kva., or 26.7 amp., with energy at 1½ cents, wire at 25 cents, loss factor 1.39 and fixed charges 10 per cent, one gets:

$$\text{C.M.} = 55{,}400 \times 26.7\sqrt{\frac{1.39 \times 1.5}{10 \times 25}} = 135{,}000\ \text{C.M.},$$

or a No. 2/0 wire.

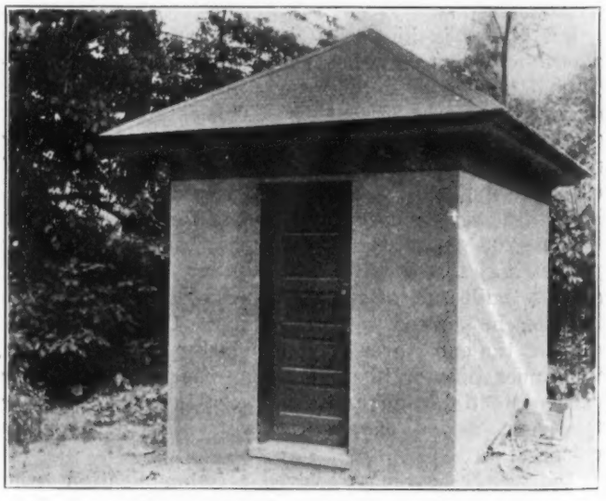
While economy is not always the deciding factor in choosing a wire size, it is wise to determine the economic size at least for important circuits, and this formula should be of considerable use.

GLEN SMITH,
Engineer of Outside Construction.
Seattle Municipal Light and Power System,
Seattle, Wash.

Attractive Primary-Meter House

AN ATTRACTIVE primary-meter house for a private estate is shown here which illustrates how the power company and the consumer can work together to their mutual advantage. The house is 6 ft. x 8 ft., of hollow tile and stucco finish, with a patent-shingle roof. Wood trim and door are painted a dark green, causing the whole to harmonize with its surroundings.

A 2,300-volt service line runs through the woods on poles and from the last pole underground to the meter house. The door is the only opening in the building, and this is locked by the power company making the installation. The consumer erected the house at his own expense from specifications furnished by the company.



METER HOUSE WHICH HARMONIZES WITH BEAUTIFUL GROUNDS OF ESTATE

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Desirability of Employee Salesmen in Customer Ownership Campaigns

Security Selling Broadens the Viewpoint of the Employee and Increases His Sense of Loyalty to the Company

IN DEVELOPING a program for security selling to customers the question arises as to whether it would be best to utilize the company's existing sales department, include all employees, or go outside of the company entirely and secure regular stock and bond salesmen. Where a company is large enough to support a security department continuously it appears to be desirable to establish such a department, which shall operate independently of other departments and solely for the purpose of selling securities.

There are many companies, however, where this would be impracticable for various reasons. The issue of stock available for sale might be comparatively small, the size of the company would not warrant a special department, or the company's financial needs may not call for the continuous sale of securities. The experiences from companies where stock has been sold are interesting.

Pointing out that a better understanding has resulted between customers and the company which has led to improved service and proper returns on invested capital, George W. Lawrence, vice-president of the Greenfield (Mass.) Electric Light & Power Company, says:

"For the larger utilities the use of the employees as a sales organization, captained by an experienced security salesman, will produce the desired results. For the smaller companies, having a capitalization of two millions or less, I believe results should be obtained by proper co-operation with the local banks, the utility company organizations aiding the banks in obtaining security purchasers. This has been the policy of this company, and at the present moment 50 per cent. of our outstanding securities are held locally."

The sale of the securities in local territory exclusively by the employees of the company itself is advocated by J. A. Hunnewell, manager of the Lowell (Mass.) Electric Light Corporation, as follows:

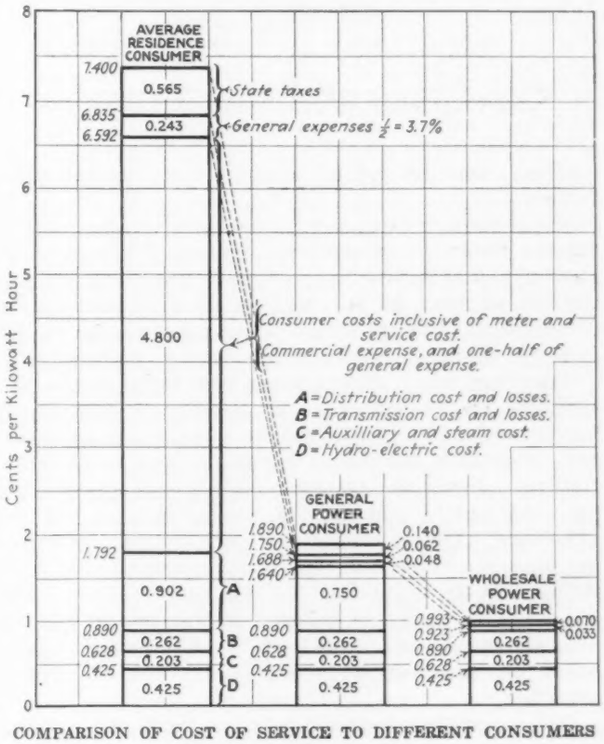
"There is no good result to be obtained by bringing in trained security salesmen, while, on the other hand, should the regular employees of the corporation take up the sale of these securities, they would obtain a very broad and strengthening knowledge otherwise difficult to secure, and would come in contact with prospective purchasers in an effective and potentially helpful manner."

C. W. Kellogg, who has supervised fourteen local campaigns on the Stone & Webster properties throughout the country during the past two years, believes that every employee should be made a salesman. "In all cases," says Mr. Kellogg, "we have endeavored to make every employee a salesman, by having him understand the value to the company of getting these securities distributed locally and of helping out in doing this as a matter of loyalty to the company. There is great value to the organization, to the public and to the employees themselves in having each employee understand the security situation of the company and in having him able to explain it to others. We have never employed any stock or bond salesmen for local sales and have never paid any commissions to employees for selling the company's securities.

"All of our local campaigns have been fairly intensive, of not over three weeks' duration, and have been strongly reinforced by advertising, changing the copy each day. Also, on account of money market conditions during the last two years in which these campaigns have been carried on, we have sold almost entirely short-term notes, rather than stock, so that our experience in local selling may for this reason not be fairly comparable with the experience of other companies."

A Graphic Explanation of Rate Differences

AN ANALYSIS by engineers of the California Railroad Commission of the cost of the Southern California Edison Company's electric service in 1921 shows some interesting and valuable comparisons of the variation in the cost of service to the average residence consumer, to the general power consumer and to the wholesale power consumer.



COMPARISON OF COST OF SERVICE TO DIFFERENT CONSUMERS

As shown in the diagram, the cost of hydro-electric

energy plus the cost of steam-station energy used as standby and the cost of transmission is equal for the three classes of consumers. Added to this base cost is the distribution cost and losses, consumer expense, general expense and taxes. This method of comparison shows clearly that it is the large number of small accounts which cause the higher rate per kilowatt-hour for the smaller consumer. It should prove a useful means of demonstrating why kilowatt-hours cannot be sold like merchandise or potatoes at the same price to all regardless of time, place or quantity of use.

Personal Contact with Customers Reduces Complaints of High Bills

BY USING the slip shown here the Virginia Railway & Power Company, Richmond, Va., has almost eliminated complaints of high bills and added a closer personal touch to its service. "It is virtually impossible to establish a personal contact with customers," says John E. Harvell, general manager, "unless something occurs out of the usual routine. We have found one of the chief causes of complaint to be from errors in meter

ATTENTION

In connection with the attached bill, your attention is called to the considerable increase in consumption over the preceding meter period. To be certain that the readings on billing as rendered were correct, special investigation was made

(Nov. 14/21), which verifies figures as turned in by meter reader.

If you are not able to trace the cause of increase, we will be very glad, on your advice, to further assist in this connection.

You will oblige us by directing your request to the Commercial Department.

Yours very truly,
G. H. SMITH,
Commercial Manager.

NOTICE ATTACHED TO BILLS SHOWING UNUSUALLY HIGH CONSUMPTION

reading. Our method of handling this problem is as follows:

"Each meter reader is required, after reading a customer's meter, to subtract the figures of the previous reading before leaving the customer's premises. On any reading showing 50 per cent increase or decrease in consumption, if the previous consumption was 50 kw.-hr. or more, the meter must again be read as a check.

"Readings which show a 50 per cent difference in consumption are turned in to the installation department for investigation. An inspector is sent out to ascertain, if possible, the reason for the increase or decrease. He first informs the customer of the readings showing the consumption and asks if he can account for the difference. Approximately one-half of the customers can name the cause, and thus many complaints are forestalled. In the event that the customer does not know the cause the inspector makes a test of the installation to locate any ground or other trouble, and if anything is found the customer is informed just how to have it corrected.

"Whenever these investigations are made the auditing department turns the bill over to the commercial department for handling. This department then delivers the bill to the customer with the notice calling his attention to the investigation. Under this system we have been able to reduce our high-bill complaints 95 per cent."

Life Extension Institute Advocates Electric Fans in Winter

MEDICAL authorities have dropped a valuable hint to the electrical trade for pushing the sale of electric fans during the off season. Dr. Eugene Lyman Fisk, medical director of the Life Extension Institute, takes the position that electric fans are often needed even more in winter than in summer. In a current bulletin of the Institute issued to all members taking periodic health tests he says:

"The business man should have his office properly ventilated and heated, and not a poor imitation of a Turkish bath. He should not let the temperature run above 70 deg., and if there is any deficiency in the provisions for automatic ventilation, as there usually is, he should start an electric fan to keep the air moving. I think it is often more needed in winter than in summer, since in winter closed doors and windows often result in humid or stagnant air.

"Confining the use of electric fans to the hot days of summer is largely a matter of sheer custom. The public should be educated to use them in winter as well. Still air, like a still pool, is always stagnant, regardless of the temperature or the season."

What Other Companies Are Doing

Philadelphia, Pa.—More than 1,200 contracts were signed for electrical installations by the Philadelphia Electric Company during the month of September, and it is estimated that October contracts are at least 5 per cent greater.

East Hampton, Conn.—In the past six months, says L. P. Perry, manager Central Connecticut Power & Light Company, the number of stockholders in this utility has doubled. There is now a stockholder for every ten meters on the system. Illustrated publicity, including picture post cards of the principal plant, and a friendly willingness to discuss policies openly with the people have aided customer ownership development by this company.

Cleveland, Ohio.—Statistics show that more than 130,000 people in Ohio now own securities of electric light and power, gas, telephone and electric railway companies. Considering families and dependents of the investors, this means that about one-tenth of the people of the state are financially interested in the public utilities. Life insurance companies and savings banks are among the heaviest investors in these securities. Every individual therefore who has an insurance policy or a deposit in a bank is vitally interested in the progress and development of the utility companies.

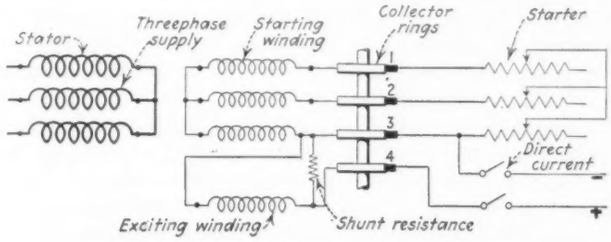
Illinois.—The Public Service Company of Northern Illinois is co-operating with more than 200 electrical contractors in pushing an extensive house-wiring campaign throughout its territory. This campaign was undertaken as a result of figures compiled by the company's commercial department showing that a large number of houses adjacent to the company's lines were unwired. The Public Service Company is taking over the electrical dealers' wiring contracts, thereby saving the time and energy spent worrying over accounts. The advertising is handled by the Public Service Company, although the contractors' names and addresses appear in the advertisements.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Synchronous Motor for Asynchronous Start with High Torque.—J. GEWECKE.—To combine the great starting torque of an induction motor with the running characteristics of a synchronous motor the author has built a synchronous motor with starting winding on its armature similar to that of an induction motor with wound armature. The author has built a three-phase, 20-kw., 500-volt, 100-r.p.m. motor of the second type, and he describes the interesting characteristics of this machine with the help of a great many curves and oscillograms. The armature has six direct-current poles and an almost continuous alternating-current winding, placed in slots in the pole pieces, resulting in four collector rings, three for the alternating current and one of these and a fourth for the direct current. Both stator and rotor are laminated with highly saturated iron so as to operate with unity power factor over a large range of load. The motor is started by



CONNECTIONS OF SYNCHRONOUS MOTOR WITH HIGH-TORQUE STARTING WINDING

placing the stator on the line and the gradual short-circuiting of the asynchronous winding over a rheostat. When the maximum speed, corresponding to the load, has been reached, the exciting direct current is impressed upon the poles of the rotor, which accelerates the machine to synchronous speed. The asynchronous winding stays short-circuited during normal operation, to prevent swinging and hunting. At the instant of connecting the stator to the line a very high voltage is induced in the field winding. To avoid any danger from this a permanent shunt resistor, connected across the two direct-current collector rings, is built into the rotor. The twelve oscillograms reproduced with the article give a very clear picture of the operation of such a machine under different conditions.—*Elektrotechnische Zeitschrift*, Oct. 27, 1921.

Cutting No-Load Transformer Losses in Rural Systems.—T. HOLMGREN.—Iron losses in farm transformers may during idle periods amount to sums comparable with the yearly capital cost of the installation, and thus have caused much discontent among rural consumers in Scandinavia. The author shows that these losses may be reduced to four-tenths by opening one phase on the high-tension side of a three-phase transformer, as proposed by Professor W. Rung in Copenhagen. A necessary condition is that the transformer be connected in delta on the high-tension side and in star on the low side. Furthermore, all such lighting service as is needed for everyday use must be connected between one of the secondary phases and the neutral. A relay arrangement is suggested whereby two secondary phases may be brought under full voltage when one phase is open on the primary. By providing switches according to the Rung method it is estimated that energy worth 500,000 crowns a year could be saved in Sweden.—*Teknisk Tidskrift, Elektroteknik*, Aug. 3, 1921.

Generation, Transmission and Distribution

Hydro-Electric Developments in Foreign Countries.—F. ROWLINSON.—The third part of a series of articles dealing with the hydro-electric developments of the world. The present article includes France, Austria, the United States, Sweden and Formosa. The developed water powers and the possible future developments are listed and the power of each is given, together with the difficulties which will be involved in developing them.—*Beama* (British Electrical and Allied Manufacturers' Association), November, 1921.

Abnormal Pressure Rise in Transformers and Its Remedy.—R. TORIKAI.—In a high-tension transformer abnormal potential gradients likely to cause a breakdown appear usually at the foot of the bushing and at the end coils. The author describes a theory applicable to both these cases, from which he concludes that these dangers may be due to the incorrect arrangement of electrostatic capacities. Following this theory, he shows that by properly grading the capacities it is possible to avoid to a great extent the dangers in the bushing and end coils. The correct gradation of the capacities is shown to be as follows: (1) The shunt capacity must be graded so as to increase with the distance from the grounded end of the coil or from the top of the bushing; (2) the capacity to ground or to the high-tension conductor should be graded so as to decrease with the distance; (3) the proportion of the shunt capacity to the capacity to ground or to the high-tension conductor should be as great as possible, and (4) it is preferable to use a resistance in series with the capacity.—*Journal of Institute of Electrical Engineers*, Vol. 59, No. 303.

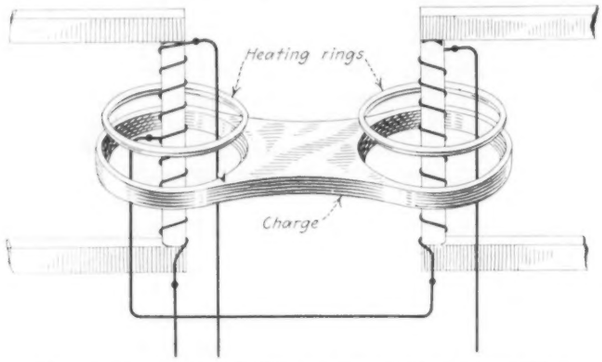
Relation of Auxiliary Drives to Heat Balance.—J. R. MCDERMET.—A comparison of direct steam drive, motor drive, house turbine and combination drives for obtaining heat balance. A method is described of heating feed water by means of bleeder condensers.—*Power*, Dec. 6, 1921.

Traction

Railway Electrification in England.—A scheme formulated for the electrification of the suburban lines of the Southeastern & Chatham Railway is described. These are lines of about 91 and 141 miles respectively. It is thought that the scheme will soon be proceeded with. A sum of £10,000,000 will be involved.—London *Electrical Times*, Nov. 3, 1921.

Installations, Systems and Appliances

Electric Brass Furnace.—H. HEIN.—An induction furnace for brass melting developed during the war is described. The Röchling Rodenhauser construction was used, with changes necessitated by the high conductivity of copper alloys, the considerable diminishing in the electrical resistance of such alloys when cooling off and the excessive pinch effect. A careful design of the shape of the heating trough, forming a horizontal figure eight, and the addition of two heating rings of wrought iron, closed in themselves and embedded into the oven lining above the charge, gave good results. Furnaces of this



SCHEMATIC ARRANGEMENT OF TWO-PHASE INDUCTION FURNACE WITH HEATING RINGS

type for three-phase and two-phase current and charges of 500 kg. to 1,000 kg. have been in operation for several years, consuming 100 kw. and 150 kw., at a power factor of 0.4 to 0.6 at 50 cycles. The oven lining is good for half a year and 800 charges. Depending on the material used, the current consumption varies between 250 kw.-hr. and 400 kw.-hr. per ton. An interesting claim is made as to the higher hygienic qualities of an induction furnace as against one of arc type due to the smaller amount of injurious zinc fumes.—*Siemens Zeitschrift,* October, 1921.

Electrophysics and Magnetism

Revision of Electromagnetitc Laws.—CARL HERING.—A summary is given of a number of experiments in which the results are either contrary to or differ from those required by the usual electromagnetic laws, and suggestions are offered as to how these laws might be revised to cover the exceptions. It is shown that a distinction, which is sometimes of critical importance, must be made between the conductor, the circuit and the current. Other experiments are described in which there are very evident and decided forces in the direction of the axis of the conductors, though the existence of such forces is denied by physicists. It is maintained by the author that a generally accepted fundamental law in mechanics should also apply to electric circuits, and if it does, it would explain all the observed forces, including some denied by physicists, and would open the doors to fields which had been closed by the acceptance of the older laws. — *Journal Franklin Institute,* November, 1921.

Mathematical Theory of Ferro-Magnetism. — JOSEF KELEN.—It is assumed that the greater part of ferromagnetic induction results from molecular magnets, placed vertically to the exciting field, in pairs of two, and so that the two magnets in each pair mutually counteract each other as regards external field. Under the impression of an exciting field the magnets are supposed to rotate to an angle whose sine is proportional to the ratio of the exciting field to a certain molecular constant, B_s. Thus each pair will form an X and give rise to an external field proportional to the exciting magnetomotive force. It is further assumed that the motion of the elementary magnets is opposed by a certain force of friction, which, together with B_s and the factor of proportionality for the angular motion, constitutes the three characteristic magnetic constants. The friction forces are not supposed to be equal for all elementary pairs but to vary according to the equation of probability. By summing up the effects of all elementary pairs the author obtains analytical expressions for the magnetization curve and for the hysteresis curve which give a remarkably good representation of experimental data. For certain values of average molecular friction constant the theoretical equations also give a very satisfactory check with the Steinmetz formula for loss per cycle.—*Teknisk Tidskrift, Elektroteknik,* Aug. 3, 1921.

Telegraphy, Telephony and Signals

Radio Equipment of the "Goliath" Airplane. — The French Compagnie des Grands Express, maintaining a regular airplane route between Paris and London, has installed on one of its "Goliath" planes a mixed radio telephone and telegraph station of 35 watts antenna output, with a sending range of 300 km. at 900 m. wave length. The complete radio equipment weighs only 55 kg. An air-propeller-driven generator for 6 volts and 700 volts and a 6-volt storage battery supply the necessary current. A three-bulb amplifier is used as receiver for all wave lengths between 300 m. and 1,000 m.—*Radioelectricité,* October, 1921.

Organization and Equipment of a New French School for Radio Work.—This article contains a technical description of a model radio school just opened in Paris for the training of military, naval and commercial operators, with an outline of the teaching program.—*Radioelectricité,* October, 1921.

Auxiliary Features of Automatic Telephone System.—W. AITKEN.—A discussion on the relay devices used to repeat sender impulses to switches. A diagram shows a method of increasing permissible range of speed and insuring certainty of action of the switching apparatus by means which render its operation independent to a large extent of any adverse conditions of the line.—London *Electrician,* Nov. 4, 1921.

Note on a Four-Electrode Thermionic Vacuum Tube.—H. J. VAN DER BIJL.—A discussion of the four-electrode thermionic vacuum tube, which the author states he did not find to be so satisfactory a detector as the audion, but which might be used with satisfaction as an alternating-current ammeter and for indicating small differences of potential in bridges. The similarity between the four-electrode tube and the audion operating with a blocking condenser in the grid circuit is admitted, but certain differences are pointed out.—*Radio Review,* November, 1921.

Carborundum and Its Rectification Effect. — H. M. DOWSET.—A study of the chemical and physical nature of carborundum, with a special view to the conditions which must be satisfied for a detector. The results of a number of experiments designed to elucidate the nature of the rectification effects and suggestions of the theory are given. Voltage-ampere curves for carborundum crystals are included.—*Radio Review,* November, 1921.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

TRANSMISSION LINE, ARTIFICIAL, WITH DISTRIBUTED CONSTANTS.

A line has been constructed whose sections consist of multilayer coils containing sheets of tinfoil between layers of wire. The constants of the coil can be adjusted to simulate various types of transmission lines. The present line consists of 130 coils corresponding to 1,000 miles of 110-kv. line, and its cost is about $0.65 per equivalent mile. The line constants are being checked by measuring direct-current transients, after which a study of alternating-current transients will be made. By means of a three-electrode vacuum tube oscillograms have been taken of the potential at various points without disturbing the natural voltage distribution.—*Massachusetts Institute of Technology, Cambridge, Mass.*

PORCELAIN, HIGH-FIRE GLAZES FOR.

An investigation has been made of high-fire porcelain glazes of the Seger cone formula type, from the standpoint of fusibility and of commercial acceptability as glazes. Tests were made on small cones, maintaining RO constant with variations in the SiO_2 and Al_2O_3. The temperature was raised at the rate of 50 deg. C. an hour above 1,100 deg. C. The deformation temperatures were from 1,100 deg. C. to 1,400 deg. C. The fusibility of the entire field was shown graphically by isotherms, plotted both by empirical formulas and by batch weights. It was found that glazing occurs when the alumina content of the glazes is low.—*H. H. Sortwell, Bureau of Standards, Washington, D. C.*

RADIO WAVEMETER, STANDARD.

An accurate standard wavemeter has been recently designed, capable of measuring wave lengths from 65 m. to 85,000 m. Particular attention has been given to the electrical and mechanical features which make for a rigidity of construction and precision of set and reading.—*Bureau of Standards, Washington, D. C.*

BEARINGS, FRICTION AND CARRYING CAPACITY OF.

Experiments have been made to determine the maximum safe load and the static friction under load of ball and flexible roller bearings. Balls were tested in grooved straight races; rollers were tested in flat and cylindrical races. The scleroscope hardness of the material tested was also determined. In compression tests deformations of 0.00001 in. could be measured. Numerical data and conclusions are available.—*Bureau of Standards, Washington, D. C.*

FIRE TESTS OF BRICK PANELS.

Tests are being made of heat penetration through, and deflection of, hollow wall panels and comparable solid walls.—*Bureau of Standards, Washington, D. C.*

WELDING MACHINE FOR SEAMS.

An automatic electric welding machine has been recently developed in Europe (*Elektrotechnik und Maschinenbau*, Vol. 38, page 571) in which a roller electrode is caused to rotate along the weld in steps, the current being "on" when the roller is stationary. Several important advantages are claimed for this process and further experiments are desirable.

RECTIFICATION, ELECTROLYTIC.

An investigation is being carried out on the use of electrolytic rectification for low-power high-voltage work.—*E. J. Berg, Union College, Schenectady, N. Y.*

MINE GASES, IGNITION OF, BY INCANDESCENT LAMPS.

Numerous tests have been made to determine the possibility of ignition of gas-filled atmosphere by an incandescent filament when the bulb is broken. Tests were conducted on 125 types of lamps operated throughout a wide range of voltages.—*Bureau of Mines, Washington, D. C.*

ILLUMINATION, DAYLIGHT.

An "artificial-daylight" reflector was exhibited at a recent meeting of the Illuminating Engineering Society in London, England. Light from a gas-filled lamp is reflected off the inner surface of a large reflector placed above the lamp, which is painted emerald green and ultramarine, with a small percentage of red.

ELEVATOR INTERLOCKS AND ACCIDENTS.

A field survey has been made of several thousand elevator landings equipped with various types of mechanical and electromechanical interlocks and contact devices. Statistics of elevator accidents have been collected as reported by the press and by the coroners' offices of elevator inspection departments of large cities. A study of non-shaft-door and shaft-door accidents shows that 73.8 per cent of all fatal accidents would probably be eliminated by the use of well-designed interlocks.—*C. E. Oakes and J. A. Dickinson, Bureau of Standards, Washington, D. C.*

TELEPHONY, CARRIER-WAVE, ON ENERGIZED ALTERNATING-CURRENT LIGHTING CIRCUITS.

Investigation of the possibility of carrying on telephonic conversation over energized lighting circuits by means of carrier-wave telephony were undertaken using carrier frequencies of the order of 1,000,000 cycles per second. By proper tuning the hum due to the power frequency could be almost entirely eliminated and excellent conversation carried on. When the receiving and transmitting stations were located on secondaries of different transformers it was found necessary to provide high-frequency paths between primary and secondary by interconnecting the two windings by means of low-capacity condensers.—*Radio Laboratory, School of Electrical Engineering, Cornell University, Ithaca, N. Y.*

ALLOYS, CRYSTALLINE STRUCTURE OF.

By examination of the X-ray diffraction pattern produced by illuminating the powdered material with a beam of monochromatic X-rays the crystalline structure of several series of alloys has been determined. The results agree well with the data for these alloys obtained by metallographic methods. In addition, the X-ray pictures make the determination of the form and axial ratios of the different crystalline species more exact. When X-rays apparatus of the proper sort becomes available generally, this method should be very useful in the examination of metals and alloys and of other crystalline materials:—*Mary R. Andrews, Schenectady, N. Y.*

METALS, SOFT, INTERCRYSTALLINE BRITTLENESS OF.

It is known that soft metals, such as aluminum, tin, lead and zinc, which are much used in the electrical industry, and in particular lead, are subject to a form of corrosion known as intercrystalline brittleness. The metal crumbles to a coarse powder in which the individual grains retain their intrinsic properties, but the bond between the grains has been destroyed. A series of corrosion tests have been carried out to determine the characteristics of this corrosion. It has been found that pure metals suffer scarcely at all, and that the simultaneous application of tensile stresses upon the metal hastens the corrosion to a large extent.—*Bureau of Standards, Washington, D. C.*

Suggestions for Research

CIRCUIT BREAKERS, DIMENSIONS OF THE OIL CONTAINER.

So far the dimensions of circuit-breaker oil containers have been determined empirically, but with more and more severe service required, it becomes desirable to develop at least rough methods of computations. The factors involved are the quantity and the pressure of the developed gases, the energy of the ruptured arc, the speed of separation of the contacts and the dimensions of the container. For a beginning in this direction see *Revue Générale de l'Electricité*, Vol. 9, 1921, p. 687.

CLUTCH, ELECTROMAGNETIC, ALTERNATING-CURRENT.

With the increasing use of synchronous motors and of Diesel engines in various industries, the demand for electromagnetic clutches has been steadily increasing because of the necessity of starting at no load. The present-type clutches are excited with direct current, which has considerable advantages in so far as the magnetic circuit of the clutch is concerned. There is, however, some demand for clutches excited with alternating currents, single-phase or three-phase, and an investigation is desired of the possible construction and the relative weights and proportions as compared with direct-current clutches.

CONTROL, TIME-LIMIT, SUBSTITUTE FOR DASHPOTS.

In automatic controllers for industrial drives there is some reaction against "lock-out" switches operating on the current-limit principle, in favor of switches controlled by some time-limit arrangement. The simplest device of this kind is a dashpot, but it has serious limitations in the gumming of oil, clogging of holes, variations of viscosity with the temperature, etc. An improved device is desired for closing contact at predetermined instants which would have all the simplicity and flexibility of adjustment of a dashpot, without its disadvantages.

REACTANCE, NEGATIVE.

The development of a negative reactance is suggested; that is, a reactance which would produce an increasing current with a sudden decrease in the voltage across it. A reactance of this type could probably be developed by a suitable arrangement of self-induction and capacity. The negative reactance, if found, would be a means for accelerating starting currents and producing undamped waves at any frequency whatever. A device of this kind has so far not been elaborated, although a limited negative resistance is the cause of oscillations produced in a Poulsen arc generator and in the dynatron oscillator.—*August Hund, Berkeley, Cal.*

HYSTERESIS.

The invention of a machine something like a planimeter or Henrici's armonic analyzer would be desirable, which when run over a hystersis loop would determine the amplitude of all the harmonics in the magnetizing current, with a sinusoidal applied voltage, or vice versa.—*R. E. Bitner, Cornell University, Ithaca, N. Y.*

PIEZO-ELECTRIC RESONATOR.

A plate or rod suitably prepared from a piezo-electric crystal, and provided with metallic coatings, can be brought into a state of vigorous resonant vibration when the coatings are connected to a source of alternating emf. of the right frequency. The plate reacts upon the circuit in a manner somewhat analogous to the reactions of a telephone receiver. The current and the equivalent resistance and capacity of the plate pass through marked characteristic changes as the frequency is varied through resonance. Another piece of solid material can also be set into vibration by a piezo-electric plate. Such resonators offer possibilities as standards of high frequency. By a graphical solution of the fundamental equations it is also possible to calculate the viscosity of the material.—*W. G. Cady, Wesleyan University, Middletown, Conn.*

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Bureau of Standards Seeks Appropriations for Electrical Work

FOR the investigation of the standards of practice and methods of measurements of public utilities, such as gas, electric light, electric power, water, telephone, central-station heating and electric railway service, the Bureau of Standards is requesting a continuance during the next fiscal year of the appropriation of $85,000 with which it has been carrying forward this work.

For the investigation of methods and instruments employed in radio communication the bureau requests $30,000. For the investigation of the principles of sound and their application to military and industrial purposes $5,000 is requested. For the establishment of standards, methods of testing and inspection of electrical and mechanical devices used in industries and by the government $100,000 is asked.

War Department to Keep a Record of Nation's Power Facilities

A CONTINUING inventory of the available easily developed electric power resources of the nation is being planned as a war-preparedness measure by means of a co-operative agreement between the National Electric Light Association through its electrical resources committee and the engineering division of the War Department.

This action has come about as a result of a request of the chief engineer of the War Department that a plan be devised so that the district engineers of his office in the larger industrial centers of the country could obtain information of power resources to aid them in case of war.

The committee has had several conferences with the engineering division of the War Department which have resulted in a circular signed by the chief engineer to his district officers directing them to institute a study of the power situation within their districts. It is stated that the study cannot be made in the form of a costly field investigation, but that its success must depend upon the co-operation given by the electrical industry. The objects of the study as stated in the circular are:

1. To obtain in each district office a knowledge of United States power-producing plants, of primary distribution interests, of the power uses and the needs of the large power consumers in the district. (This information will include the maximum power output which can be maintained by each of the power establishments, giving regulation and capacity of the principal generating plants and the seasonal variation (if any) in this capacity, the maximum loads, the additional loads that could be carried, the spare or reserve capacity, including breakdown units available in each state to meet war conditions and buildings of what size and where this capacity can be delivered.)

2. To cultivate the acquaintance of the principal persons engaged in the business of power production and distribution, and in businesses which are large consumers of power. (An indexed list of the personnel of each power production company is to be built up in each district office, each card of this list to state forth briefly the position and duties of each individual.)

3. To obtain the co-operation of the power producers in furnishing the above knowledge and in planning their extensions and new developments in such manner as will meet the needs of the locality in case of war.

4. To ascertain whether or not the district is surveyed for development of increased power resources, by combining river navigation improvement with power generation, by combining flood regulation with power regulation, or by any other means.

5. To ascertain the best plan for the government to adopt for developing the power resources of the country and administering the distribution of power in the district in case of war. (The circular indicates that the plan used by the government during the last war in determining and fixing priority of use and advancing money for increases of plant extensions and interconnections not necessarily needed in these times undoubtedly will be followed should another war occur.)

The circular indicates that in the event of another war the personnel for handling the power situation would undoubtedly be built up from men familiar with power production in their own districts. It is suggested and it may be found desirable to begin at once to build up a paper organization and assign a personnel to it as reserve officers.

United States Chamber of Commerce Suggests Tariff Policy

A SUGGESTED tariff policy for the United States which, if accepted, would mean a radical departure in some instances from past principles and practices was early last week put to a referendum vote of the 1,400 commercial organizations making up the membership of the Chamber of Commerce of the United States. This policy contains seven recommendations and one question, as follows:

Legislation should permit, in the event of changes of economic factors, adjustment of tariff rates by administrative authorities within limits prescribed by Congress for the purpose of maintaining a consistent tariff policy.

Creation of a tariff adjustment board to administer adjustable rates.

Reasonable protection for American industries subject to destructive competition from abroad and of benefit to any considerable section of the country.

The anti-dumping legislation of May, 1921, should be maintained in principle.

The principle of maintenance and encouragment of our export trade should be observed in tariff legislation so far as consistent with protection of American industries of benefit to any considerable section of the country and subject to destructive competition from abroad.

Tariff legislation should be framed and administered with a view to meeting discriminations, direct or indirect, by other countries against American trade.

The present system of valuation for levy of ad valorem duties should be maintained and the so-called "American valuation" should not be adopted.

Do you favor a postponement of general tariff revision

until conditions in international trade and finance are sufficiently stabilized to form a basis for legislation possessing permanent value?

The seven recommendations were adopted unanimously by a committee of twelve representative business leaders, with the exception of the recommendation against the "American valuation" plan, one member of the committee favoring this device. The committee has issued its reasons for advocating each of the proposed principles. These reasons, together with arguments in the negative, have been sent to the membership of the chamber. The committee also, on its own part, answers in the affirmative the question appended to the recommendations, saying:

Surely it would seem that a general revision of the customs tariff at this time based on such data as are now available could not meet the needs of American commerce and industry through any considerable period. Certainly in the absence of a flexible scheme of rate adjustment we must express a doubt as to the wisdom of such a revision at this time.

Vanderlip Proposes Plan for American Rebuilding of European Industries

BEFORE the Economic Club of New York on Monday evening of last week, Frank A. Vanderlip proposed a new method of settling the Allied debt to this country which would create a revolving fund from the interest money paid to us by the Allies, from which loans could be made to the impoverished governments of Europe for production purposes. Mr. Vanderlip has recently completed a tour of Europe made for the study of economic conditions. While he maintains that the Allies should pay their obligations, he would temporarily devote all payments to the creation of credit. This credit he would have used for the improvement of transportation, the revival of essential industries, the production of adequate food supplies and the resumption of education and scientific research.

In commenting on the rebuilding of European industries Mr. Vanderlip said:

Europe needs better transportation. We could help provide it. Europe needs a great development of its ample hydro-electric power in order that it may have cheaper motive power and may economize its far too small fuel supply. We could aid in initiating such projects.

If time permitted, I would emphasize what might be done for Italy and Austria in developing great hydro-electric possibilities. If we took only six months' interest, $250,000,000, and put it into hydro-electric development, taking in exchange a mortgage on that development, we should have provided in those two countries for a saving in coal imports which would materially help them balance their foreign trade, and we would obtain for ourselves a sound security which would ultimately be repaid.

If we would devote the income for a few months toward equipping eastern Europe with a modern grain elevator system, we would confer a material blessing on Eastern peasants and Western consumers alike, stimulating production and helping to turn stagnant trade into a swift stream of commerce.

The debts are just debts and should be paid. The expenditure of the money we received would be made where and how we willed. Its expenditure would be our affair, not the affair of the debtors. Some part of what we received, however, would probably be spent without possibility of direct return. If such expenditures were wisely made, the indirect return would be enormous.

I would not plan to take from England, France and Italy the last dollar that could be forced from them to pay their debt to us, and then spend it all in eastern Europe—great as the indirect recompense of such an expenditure would be in benefiting those Western nations. I would let a portion of the money that they paid us be expended within their own borders.

I would propose to England the establishment of great scientific laboratories. With her genius for sound scientific research she would, through a stimulation of technical education and scientific investigation, give to the world new knowledge of incalculable value.

I would give Italy, if she agreed to have it, the means for establishing great schools of applied art, so that the tremendous genius for handicraft which the Italian possesses may be turned into channels which will produce goods to enrich the world.

Heat-Balance Methods Interest A. S. M. E. Members

METHODS of maintaining a heat balance, or making the most economical use of heat, were, from the viewpoint of power-station engineers, the most interesting subject discussed at the forty-second annual meeting of the American Society of Mechanical Engineers, held in New York last week. Four papers on the subject were presented, each dealing with a different method. One referred to the Philadelphia Electric Company's Delaware station, where combination motor and steam drive is used, the electric power being supplied from the main bus. Another paper related to the Colfax station of the Duquesne Light Company, which has a combination auxiliary system of steam and motor units supplied from house alternators. The third paper presented data on the Connors Creek station of the Detroit Edison Company, where the auxiliaries are motor-driven and supplied with power from house alternators. The last paper gave a brief description of the system at the new Hell Gate station of the United Electric Light & Power Company, New York, which employs electric drive almost exclusively for auxiliaries, one-half of the power being obtained from the main generators and the rest from the house alternators with no provisions for interconnecting the two sources. The papers were presented by E. L. Hopping, C. W. E. Clarke, D. H. Berry and J. H. Lawrence, respectively.

Next in interest created were the papers on boiler-plant efficiency and economy and fuel saving in relation to the investment which is necessary. These were presented by Victor J. Azbe, Dr. D. S. Jacobus and Joseph Harrington, respectively.

In the discussion of heat balance J. A. Stevens, J. P. McDermott, John Andersen, N. E. Funk, Francis Hodgkinson, Charles Penrose, R. J. S. Pigott, Prof. L. P. Breckenridge, T. E. Keating, L. J. Pope, G. H. Gibson, G. A. Orrok and other engineers took part.

American engineers were criticised by Mr. Stevens for being behind European engineers in the use of the higher pressures and superheats. He recommended 350 lb. pressure and 250 deg. Fahr. superheat at least.

Mr. McDermott expressed the opinion that the Philadelphia auxiliary system is the most reliable and flexible, and that these factors are more important than economy, although the latter should be maintained as high as possible. While the house turbine system is now in favor, the extraction heater systems permit the highest efficiency. Mr. McDermott also pointed out that the high superheat in auxiliary exhaust cannot be used economically and that the disadvantage of electric drive supplied from the main generators is their susceptibility to system disturbances. The air extractor

has the advantage of reducing vent losses and increasing boiler efficiency through allowing economizer action.

N. E. Funk differed with Mr. Stevens regarding the advisability of using higher steam pressures and temperatures, saying that this should be determined by the over-all operating expense, which includes fixed charges.

The idea that the water rate of auxiliaries is not important was ridiculed by Mr. Hodgkinson. He advocated stage bleeding and operation of main auxiliaries from the main bus to obtain the greatest economy.

Mr. Pigott emphasized the necessity of studying heat balance at various loads and advocated the preparation of input-output curves when comparing different systems of heat balance.

Heat balancing is not the important subject, said Mr. Orrok. It is how to use the heat most efficiently. This can be done by modifying the Rankine cycle of prime movers in such a way that it will approach the Carnot cycle. Taking steam from the expansion side of the diagram and applying it to the opposite side will help. This can be done by bleeding turbines, use of multistage feedwater heaters, etc.

At the special session on Tuesday evening Dexter S. Kimball, dean of the College of Engineering, Cornell University, was presented as the new president of the A. S. M. E.

West Penn Power Company and Monongahela Power & Railway to Interconnect

THROUGH the purchase of the West Virginia & Maryland Power Company of Kingwood, W. Va., by the West Penn Railway Company, interconnection with the Monongahela Power & Railway Company has been facilitated. The West Virginia & Maryland Power Company will supply electric service from Grafton, W. Va., eastward through Taylor and Preston Counties in West Virginia and Garrett County, Md., into the coal fields along the upper Potomac. The plant at Grafton was recently purchased by the incorporators of the West Virginia & Maryland Power Company, and the sale to the West Penn carries with it the transfer of the Grafton plant.

Work has already been started on a power transmission line connecting with the present system of the West Penn Power Company and extending south through the Cheat River Basin to Tunnelton, Rowlesburg and Newburg, on the main line of the Baltimore & Ohio Railroad. Arrangements have also been made whereby a direct power transmission line will be built from Grafton to Rivesville, on the Monongahela River, just below Fairmont, at which point there is a large power plant of the Monongahela Power & Railway Company. Service for Grafton will be purchased from this latter company, and it is expected that at an early date transmission lines from the West Penn system will connect with the line from Rivesville, thus making a substantial tie-in connection between the plant of the Fairmont company and the West Penn system.

Distribution of World's Water-Power Resources

THE distribution of the world's developed and undeveloped water-power resources will be set forth in Part 2 of the United States Geological Survey's "Commercial Atlas," which is to be issued Jan. 1.

Colorado River Development Resolutions Fail of Adoption by League

THROUGH fear that resolutions inimical to government or municipal construction of projects on the Colorado River would be passed or proposed at the convention of the League of the Southwest, which was held in Riverside, Cal., last week, the convention was hurriedly closed by motion of a member of the Public Power League of Los Angeles, which is an organization fostering political ownership of hydro-electric power in California. At the moment the convention closed a set of resolutions drawn up by representatives of the States of Arizona, Nevada, Utah, Colorado, Wyoming and New Mexico was ready for presentation holding to the theory that all permits for the use of interstate water should be subject to the rights of the several states for an equitable division of the waters.

Early in the course of the three-day meeting it was apparent that the adherents of municipal ownership were present in sufficient numbers to prevent an expression of the true opinion of the majority of the states represented. Although the meeting was attended by more than a thousand delegates and visitors and addressed by notable speakers, the entire aim of the convention was thwarted. The purpose of the meeting was to gather the opinion of the states of the Southwest in regard to the mode of procedure for the development of the entire Colorado River and to present this to the Secretary of the Interior at the subsequent San Diego meeting.

A program of over two dozen addresses was presented which covered every phase of the development of the Colorado River basin. Each state in the basin was represented by one or more speakers. O. C. Merrill presented a paper on the attitude of the Federal Power Commission, of which he is the executive secretary. Mr. Merrill stressed the point that the development should not be made by an agency that was restricted by state lines, and that, while this did not mean government operation, it did mean that the development should be by a single interconnected system which could take advantage of the improved load factor of such a large territory.

The attitude of the Southern California Edison Company, which has made filings for power on the Colorado aggregating more than 2,000,000 hp., was stated by R. H. Ballard, who read a statement by President Miller to the effect that the company was ready immediately upon the issuance of permits by the Federal Power Commission vigorously to proceed with this work and that it was in a position to procure from $30,000,000 to $40,000,000 per year for the construction of works which would remove the flood menace and provide power in units sufficient to meet all demands.

Director A. P. Davis of the United States Reclamation Service said that no plan of development should be undertaken until the Colorado River Commission, which has been constituted by the several states concerned and one federal representative, has completed its work and allocated the water and benefits to the several states. It is reported that President Harding has appointed Secretary Hoover to be the federal representative on this commission.

Secretary Fall said that the government was the only agency that could properly protect the interests of all and that in his opinion the government alone should undertake this work.

C. C. Chesney 1921 Edison Medalist

THE Edison medal for the year 1921 has been awarded by the Edison medal committee of the American Institute of Electrical Engineers to Cummings C. Chesney, manager and chief engineer of the Pittsfield works of the General Electric Company, for "early developments in alternating-current transmission." The Edison medal was founded by the Edison Medal Association, composed of associates and friends of Thomas A. Edison, and is awarded annually by a committee consisting of twenty-four members of the A. I. E. E. for "meritorious achievement in electrical science, electrical engineering or the allied arts." Previous awards of the medal have been made to Elihu Thomson, Frank J. Sprague, George Westinghouse, William Stanley, Charles F. Brush, Alexander Graham Bell, Nikola Tesla, John J. Carty, Benjamin G. Lamme, W. L. R. Emmet and Michael I. Pupin.

Congress to Make Effort to Limit Issuance of Tax Free Securities

A VERY determined effort will be made at the present session of Congress to obtain legislation to limit or prevent the issuance of tax-free securities by states and their subdivisions. Representative Foster of Ohio has introduced a constitutional amendment which provides that Congress "shall have power to lay and collect taxes on incomes derived from obligations issued or created by a state or any political subdivision thereof after the ratification of this article, without apportionment among the several states and without regard to any census or enumeration."

The difficulty with any constitutional amendment is the probability that its ratification by the states cannot be secured. A suggestion which is receiving serious consideration is the placing of a heavier inheritance tax on tax-free securities. Any such legislation would be reflected immediately in the sales value of such bonds and would act as an automatic check on their sale. There is a very general feeling in Congress that some way will be found to limit the issuance of such securities.

Electrical Contractor-Dealers to Try Out Labor Cost Record System

WITH a view to adopting a standard manual of cost estimating for electrical contractors the National Association of Electrical Contractors and Dealers has issued a bulletin consisting of instruction and data sheets for a labor cost system. It is proposed that every contractor shall apply the system occasionally to one job in order to obtain accurate data upon which to base labor estimates. Twenty-one members in the principal cities throughout the country have agreed to give the system a trial on the first representative piece of work which they do in order to facilitate the collection of data.

The system has been prepared by the association's cost data committee, of which Arthur L. Abbott is now chairman, and is the result of more than two years' work on the part of this committee. It is the outgrowth of methods which have been used by the Chicago Electrical Estimators' Association, the Minnesota State Association and the Electrical Estimators' Association of Greater New York.

While the proposed labor cost record system is of a tentative nature, it is expected to form the basis for a uniform method of estimating. "Specifically," says Mr. Abbott, "it is proposed that the so-called manual which has been discussed be adopted by the national association on a tentative basis as the beginning of a complete manual of estimating to be revised and added to as experience and further study may determine."

Secretary Fall Conducts Colorado River Hearing at San Diego

AN ALMOST unanimous agreement by the delegates present was given to the policy of government construction and control of a dam on the Colorado River at Boulder Canyon as expressed by Secretary of the Interior Fall and Director of the Reclamation Service Davis at the hearing conducted at San Diego, Cal., on Monday by Secretary Fall for the purpose of hearing any objections to the plans of Director Davis as reported by him to Secretary Fall last July under the provisions of the Kincaid act. The hearing was extended in scope to cover any general phases of the development of the Colorado River basin, but no general discussion resulted. The only objections were entered by the states in the upper part of the basin, which maintained that their water rights must not be jeopardized by any prior appropriations made in the lower basin or because of any dams constructed below the Utah state line.

Statements that the work could well be done by private interests were made by H. H. Craig of the Southern Sierras Power Company and R. H. Ballard of the Southern California Edison Company.

Foch Made Honorary Member of National Engineering Societies

MARSHAL FOCH was made an honorary member of the four national engineering societies on Tuesday of this week at an imposing ceremony at the Engineering Societies Building in New York. The four societies are the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Society of Civil Engineers and the American Institute of Mining and Metallurgical Engineers. The certificate of honorary membership was presented by Col. William Barclay Parsons, who commanded the Eleventh Engineers, the first engineering regiment to go abroad, which gained fame by rushing to the aid of Haig with picks and shovels when the Germans made their drive for the channel ports. Col. Parsons said:

Marshal: The art of engineering was defined a long time ago as "the art of directing the great sources of power in nature for the use and convenience of man." No better definition can be found today. Of all the sources of power in nature, the greatest, the most valuable, and at the same time the most difficult to direct, is the energy of man himself. He who can direct human energy and turn it to the service of mankind is a great engineer.

You, Marshal, have directed a greater mass of human energy than any other man has ever done; and you have successfully directed this mass for the highest uses of mankind, in that you by its aid have preserved for him one of the most precious of human possessions—liberty, liberty not only for your own illustrious country, but for all the nations of the world.

The four national engineering societies of the United States now desire to make record of their appreciation of this fact and to convey to you an expression of their most profound admiration for the great leader of men by conferring on you honorary membership in all the societies, the

highest honor in their gift and one hitherto never conferred on a single individual.

Four thousand members of these societies were enrolled in the armed service of the United States, the greater part of whom had the glorious distinction to serve the common cause in France under your orders. They heard the voice and they saw the hand of the master as he led them through battle to victory. Now we desire that you will still continue to lead us, but in peace, by permitting us to inscribe your name at the head of our roll of honor, where it will be, as your deeds have been, an example to us to do better work, and where it will remain forever a noble inspiration for all future generations.

Marshal, in the name of those members of the societies who served under your orders and particularly in the name of those who fell on the field of honor in France, I salute you!

In responding Marshal Foch said:

It was due largely to the engineers and the engineering industries that the war was brought to a successful conclusion. The armies could not have accomplished much without the effort of the engineer. Success was made possible to a great extent by the industry of the people at home, but when decisive moments arrived the engineer stood out as an essential factor in attaining success.

What would have become of the armies without the engineering industries and without the professional knowledge which you exercised and which enabled us to lead our armies in the field, to feed them, to protect them and to facilitate their forward movement.

A statement issued by the engineering societies emphasized the character of Marshal Foch as an engineer. The statement said:

Unanimously the governing bodies of the four national engineering societies have voted to confer this signal honor, the only one of its kind, in expression of the appreciation of American engineers for the services of this master of engineering principles, the unique commander of commanders of the defenders of civilizations.

The Marshal's visit and tour as guest of the American Legion have not only been timely with the conference on reduction of armament, but have also most opportunely revived and enhanced our appreciation of the Marshal's incomparable service and of the victories of the soldiers of the united nations typified by the American Legion.

The fundamentals of engineering achievement are co-operation and co-ordination. It was the ability of Foch to supplement his military genius with the effective co-operation of the commanders of the armies of five nations and the co-ordination of their operations that won the great victory.

Ferdinand Foch studied engineering in the Ecole Polytechnique and the Ecole d'Application d'Artillerie. He served on the technical section of the Ministry of War early in life and in later years was a full professor in the Ecole de Guerre.

No man can attain eminence as a commander of modern armies without mastery of the principles and practices of several branches of engineering. Ferdinand Foch was not only trained in the applications of engineering to military purposes, but also taught some of these branches in France's notable war schools and practiced them in the field.

Geological Survey to Report on Developed Water Powers in February

THE Geological Survey's report on the developed water power of the United States will be issued early in February. This report covers only the developed projects generating 100 or more horsepower; it will not be comparable with the report on developed water power issued by the Bureau of the Census in 1908. That report covered 31,600 plants. Of this number, however, only 600 were generating more than 1,000 hp. The remaining 31,000 plants had an average capacity of only 47 hp.

The "Electrical World" Street-Lighting Tables for 1922

FOLLOWING its practice for thirty-four consecutive years the ELECTRICAL WORLD has prepared tables showing the proper time for lighting and extinguishing street lamps. The 1922 tables will be ready in a few days, and a copy will be sent free to any subscriber upon request to ELECTRICAL WORLD, Tenth Avenue and Thirty-sixth Street, New York. For more than one copy a charge of 25 cents each is made to cover a portion of the postage, printing and compilation costs.

United States Amateurs Send Radio Messages to Scotland

AMATEUR operators sent radio messages from this country to Scotland during the last ten days which were reported as strong and steady by the representative of the Amateur Radio Relay League, who was in Scotland to receive the signals. The transmitting sets were limited to a rating of 1 kw. maximum and to a wave length of 200 m. This is in contrast with the commercial transmitters rated at 100 kw. to 1,000 kw. or over, using long wave lengths. According to reports received up to Dec. 13 by the Radio Corporation of America, all of the successful senders employed vacuum-tube transmitters. The receiving apparatus was adapted to very fine tuning. Nearly all of the messages received were sent from New England and New York State.

Utilities Seek Millions in Savings Banks for Investment

PRESIDENT BUMP of the National Electric Light Association has appointed representatives of that body to serve upon a joint committee with the National Conference of Mutual Savings Banks which will study state laws for the purpose of suggesting legislation, where needed, to make sound electric light and power company securities a legal form of investment for the funds held by savings banks and trust companies. The following will represent the bankers' organization: V. A. Lersner (chairman), comptroller Williamsburg Savings Bank, Brooklyn, N. Y.; J. M. Wilcox, vice-president Philadelphia Savings Fund Society, Philadelphia; George E. Brook, president Home Savings Bank, Boston; W. E. Knox, vice-president Bowery Savings Bank, New York City, and Milton W. Harrison, secretary National Conference of Mutual Savings Banks, New York City. The N. E. L. A. representatives will be M. S. Sloan (chairman), president Brooklyn Edison Company, Brooklyn, N. Y.; S. A. Farrar, vice-president Electric Bond & Share Company, New York City; L. F. Musil, treasurer Henry L. Doherty & Company and Cities Service Company, New York City; H. M. Addinsell, Harris, Forbes & Company, New York City, and C. L. Edgar, president Edison Electric Illuminating Company of Boston.

After a thorough study by this committee the N. E. L. A. Public Relations Section Committee on Relations with Bankers will carry the work on through local members and representatives in each state, who will co-operate with local savings banks' representatives in each state. If this work be successful, it is anticipated that at least $150,000,000 will be almost immediately available for investment in central station securities.

State Power Maps Available

MAPS of Massachusetts, Connecticut, Rhode Island, New York and Pennsylvania showing location of power stations and transmission lines and names of the power companies have recently been published by the United States Geological Survey. It was originally planned to publish these maps in the water-supply papers, which were to contain tabular information in regard to the equipment of these stations and the chief characteristics of the transmission lines; but to avoid expense and the delay incident to that form of publication they will be issued separately and sold by the survey for 50 cents each. Similar maps of New Hampshire, Vermont, Maine, New Jersey, Maryland, Delaware and the District of Columbia are in the course of preparation.

Motor Specifications for Steel-Mill Main-Roll Drive

AFTER two years' discussion on the subject of standardization of rating of large rolling-mill motors, general specifications for alternating-current machines for this purpose have been issued, as revised, by the Association of Iron and Steel Electrical Engineers. These specifications, it is stated, represent the consensus of opinion of not only a large majority of users, but also of the designers of such motors.

Unless otherwise specified, motors are to be designed on the 50-deg. temperature-rise basis or on what is known as the single-rating basis. It is emphasized that the rating of the motor must include all overload capacity.

For comparative purposes it is recommended that mill operators ask the manufacturers to give them the approximate 50-deg. rating of their various motors now installed, in order that future installations may be compared with this rating rather than with the old 35-deg. or 40-deg. rating.

It was stated at the annual convention of the association in Chicago last September that "a few detail changes were made in the text as printed last year, but in general the specification is now finished and will not require revision until further development takes place in the art."

Georgia Electrical Men Discuss State Licensing of Contractors

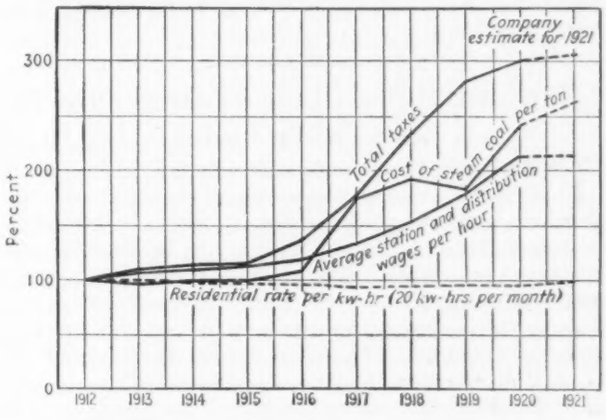
AT THE second semi-annual meeting of the Georgia Electrical Association, held in Columbus, Ga., on Dec. 8 and 9, the principal point brought up for discussion was state licensing of electrical contractors, the proposed bill on the subject being presented by R. M. Walker of the Walker Electric & Plumbing Company of Atlanta. It was the general opinion of the meeting that the subject should be approached with great care in order to avoid embarrassing complications. The matter was referred back to a committee for more thorough investigation.

W. R. Collier, general sales manager of the Georgia Railway & Power Company, outlined a plan for the comprehensive education of the building contractors and architects to the value and necessity of additional convenience outlets in the home. Acting upon his suggestion, a special committee to handle this line of activity was created and instructed to start active work at once.

Following a dinner at the Ralston Hotel, C. M. Young, for many years chief engineer of the Columbus Power Company but now an engineer in the textile business, sketched briefly the hydro-electric developments in and around Columbus, saying that with proper encouragement it would be a question of a very short time until 150,000 hp. in hydro-electric developments on the Chattanooga River around Columbus would be complete.

How Nearly Electric Rates Kept Pace with Taxes, Coal and Wages

AN INTERESTING study of the relation of the trend of residential electric rates to the trend of the three principal items in the cost of operating an electric light and power company—coal, taxes and wages—has just been made by the Empire State Gas and Electric Association. The results, which were obtained from data furnished by seven large New York State properties, are shown in the accompanying diagram. While the three items of cost have soared, rates are even less than they were in 1912. The rate line was obtained by averaging the bills that a domestic consumer would pay if he were to use 20 kw.-hr. a month.



RELATION BETWEEN TAXES, WAGES, COAL COST AND RATES

Lackawanna Again Asks for Electrification Bids

THE Delaware, Lackawanna & Western Railroad has requested the General Electric Company and the Westinghouse Electric & Manufacturing Company to prepare estimates for the electrification of about 40 miles of track in the anthracite region near Scranton, Pa. Officials of the railroad are reported to have said that the cost would total between $5,000,000 and $6,000,000. This is the second time that bids have been asked for. Estimates were received by Gibbs & Hill, consulting engineers for the road, in July, but were found unsatisfactory. It is felt that more satisfactory estimates can be secured now that prices are lower. It will probably be some months before these estimate figures can be prepared.

St. Lawrence Commission Will Soon Make Recommendations

THE International Joint Commission is holding daily sessions in Washington at which all aspects of the St. Lawrence project are being considered. The commission expects soon to arrive at definite conclusions in regard to this project and to submit recommendations.

Action Asked on New York Electrical Code

THE Board of Aldermen of New York City has been asked by Mayor Hylan to take prompt and favorable action on an amendment to the electrical code of New York City submitted by Commissioner Hayes of the Department of Water Supply, Gas and Electricity. The amendment was submitted to the board in July, 1920, and one of its purposes is to bring the code up to date with the national code in force at present. The proposed amendment also provides the commissioner with the power to appoint members of the electricians' license board annually. Under the present law a member of the board once appointed may not be removed except for misconduct in office. A third provision gives the department power to collect fees for inspection of all wiring jobs. This feature of the amendment has aroused considerable antagonism among various business interests.

Kansas Utilities Discuss Future Growth and Public Policy

THE place of the public utilities in the future growth of Kansas and matters of public policy were the principal subjects of discussion at the annual meeting of the Kansas Public Service Section of the National Electric Light Association at Hutchinson on Thursday and Friday of last week. Prof. George C. Shaad of Kansas University presented the paper on "The Future Kansas—the Public Utility a Factor in Growth," by Dean Walker of the Engineering School of the university, Dean Walker being unable to be present. The author of the paper warned the utility men that future industrial growth in Kansas was dependent on the proper development of power resources. While Kansas' manufactured products exceed the value of agricultural products, Dean Walker told the utility men that future growth of industry must not be expected to come as a matter of course. It may be retarded or diverted to other localities if a short-sighted policy in power supply development is followed.

Horace M. Davis, secretary of the Middle West Section of the N. E. L. A.; Keith Klevenger, R. H. Timmons and Director Bell of the Missouri Committee on Public Utility Information discussed the formation in Kansas of a similar committee. Steps were taken toward the establishment of such a committee.

A new movement in extending electric service in Nebraska was described by W. B. Roberts, president of the Nebraska Section of the N. E. L. A. A development company that includes in its relationships most if not all the construction contractors in the state has been formed. Municipalities are asked to issue bonds for the purpose of building transmission lines to tie into the nearest central station. Contracts for wholesale power at the respective city limits and for the maintenance of the line for a period of twenty years are entered into with the central-station company by the municipalities. The maintenance contract is on a cost-plus basis. The development company undertakes to furnish all plans and specifications and also plans the ordinances, bond issues and all other details in connection with the project. A number of municipal plants have been superseded by this method of obtaining energy.

The danger involved in using iron wire in situations where future extensions of service or growth of load is at all possible was emphasized by E. W. Rice, superintendent of distribution and electrical engineer of the Garden City Power Company, who placed the maximum current capacity of such conductors at 5 amp. to 6 amp. In situations where iron wire has been used and must be changed on account of load growth he asserted that now is the time to make the change on account of the low cost of copper.

Viewing the farm as an industrial establishment different only in form from the factory, J. C. Martin, Western editor of the ELECTRICAL WORLD, interpreted the demand for rural service as a call on the electrical industry to extend the benefits of electric service to industrial establishments and homes that are only now realizing their need of the service from an economic standpoint. Rural lines are not different in essentials from any other lines and the utility men were urged to look at them in this light. Courage to face and carefully analyze the problem and ask for adequate rates for the service was urged.

At the banquet on Thursday evening F. W. Herbert, from N. E. L. A. headquarters, and Vice-president Davidson of the N. E. L. A. told of the association activities, and Chester Leasure, managing editor of the Hutchinson *Gazette*, entertained the utility men with clever and witty take-offs of utility and newspaper affairs.

The officers elected for the coming year were: President, W. W. Austin, Cottonwood Falls; first vice-president, C. A. Fees, Concordia; second vice-president, W. A. Scothorn, Junction City; secretary and treasurer, T. T. Parker, Emporia.

Valuation of New York Telephone Property Under Way

HEARINGS are being conducted at Albany by the Public Service Commission of New York and the New York Telephone Company in accordance with the commission's recent ruling that the only way to establish a rate basis is to have a statewide valuation of the company's properties. The next hearing is set down for Dec. 12. Both the commission and the company are proceeding as expeditiously as possible and it is thought that a final determination of values will be had by the middle of January. Whether the values so determined will have the effect of raising or lowering telephone rates is a matter that can be determined only after the valuations are fixed.

Service Charge on Gas Sustained by Rhode Island Supreme Court

THE Rhode Island Supreme Court has issued a decision declaring legal a service charge made for gas by the Providence Gas Company and dismissing the appeal of the City Council of Cranston against an order of the Public Utilities Commission allowing the company to institute its present schedule of rates and a service charge of 50 cents a month.

The opinion by Judge Sweeney says: "The service charge is an equal distribution of those burdens incidental to the manufacture and distribution of gas which should be borne by all consumers, irrespective of the quantity used. The consumer of gas pays his equalized cost of the service, and neither the small consumer nor the large one is compelled to carry a load that should be shared by both."

Tentative Program of Western Inspectors' Chicago Meeting

FOR the seventeenth annual meeting of the Western Association of Electrical Inspectors, which will be held at the Hotel Sherman, Chicago, on Jan. 17, 18 and 19, the following tentative program has been adopted:

TUESDAY, JAN. 17

Morning.—President's address; reports of executive committee, secretary and treasurer; "Army Signaling," by Major J. C. Maugorgne; "Installation and Uses of Radio Equipment," by L. E. Whittemore, Bureau of Standards.

Afternoon.—"Reduction of Life and Fire Hazard at Meter Installations," by Joseph C. Langdell, Hodenpyl, Hardy & Company, Jackson, Mich.; "Safety First," by H. J. Burton, Consumers' Power Company, Jackson, Mich.; "The Uses of Armored Conductors," by J. M. Collins, secretary Electrical Contractors' Association of Chicago; "Power Requirements of a Physician Using Electricity for Therapeutic Purposes," by Dr. J. Walter Wigelsworth, Chicago; "Identification of Grounded Circuit Wires," by A. R. Small, vice-president Underwriters' Laboratories, Chicago; general subject, "The Unity of the Electrical Industry": (a) "The Electrical Manufacturer's Co-operation," by a representative of the Associated Manufacturers of Electrical Supplies; (b) "The Electrical Contractor and Dealer's Co-operation," by a representative of the National Association of Electrical Contractors and Dealers; (c) "The Central Station's Co-operation," by a representative of the National Electric Light Association.

WEDNESDAY, JAN. 18

Morning.—Discussion of inspectors' problems. (Members are requested to present these to the secretary in writing as far in advance of the meeting as possible.

Afternoon.—Tests of Electrical fittings and materials at the Underwriters' Laboratories.

THURSDAY, JAN. 19

Discussions of inspectors' problems (continued), reports of special committees and election of officers.

Inspection tours are scheduled for Friday, Jan. 20.

Indiana Electric Corporation Asks for Rehearing of Merger Plan

THE Indiana Electric Corporation has filed a petition with the Public Service Commission asking for a rehearing of the proposal to issue a large amount of securities for the purchase of the properties of seven electric utilities of the state. The Joseph H. Brewer interests, which are back of the corporation, proposed in the original petition to issue approximately $21,000,000 of securities to be used in effecting the merger. This petition was denied by the commission, after an extended investigation and hearing, on the ground that the value of the properties, estimated at approximately $19,000,000 by the corporation, is not sufficient to warrant the large issue of securities.

The petition for rehearing indicates that the amended petition would ask for authority to issue securities of smaller amount. The amount of securities to be proposed, however, is not disclosed.

The companies which the corporation proposes to purchase are the Merchants' Heat & Light Company, Indianapolis; the Indiana Railways & Light Company, Kokomo; the Elkhart Gas & Fuel Company, the Valparaiso Lighting Company, the Wabash Valley Electric Company, the Putnam Electric Company and the Cayuga Electric Company.

A number of the cities affected by the proposed merger vigorously opposed the project when it originally came before the commission. At the hearing it developed that the value of the properties as appraised for taxation purposes is several million dollars below the valuations made by the corporation. This point was strongly urged by the attorneys opposing the plan. The order of the commission said: "The commission is of the opinion that there is not enough fair value in the properties sought to be purchased by the petitioner to warrant the assuming and the issuing of that amount of securities bearing fixed charges which the petitioner says are necessary to consummate the purchase thereof, to say nothing of other capital obligations."

Federal Power Commission Issues First Annual Report

A COMPREHENSIVE view of the organization and work accomplished by the Federal Power Commission to Nov. 1 of this year is contained in its first annual report, just issued. The report is divided into several parts, dealing with the detail organization of the commission, the results accomplished, special investigations made by the commission engineers, the passage and a summary of the federal water-power act, and the jurisdiction of the commission.

By Nov. 1, 1921, 260 applications had been filed with the commission, of which 185 were for preliminary permits and 75 for licenses. After deducting conflicting applications and applications rejected or withdrawn, the applications on file aggregated 11,060,000 primary horsepower and 16,826,000 hp. of estimated installation. Of these applications, 81 affect navigable rivers, 100 public lands, 26 Indian reservations and 153 national forests. The projects are situated in thirty-three states, the District of Columbia and the territory of Alaska.

Up to Nov. 1 final action had been taken on eighty-nine applications, of which thirty-one were acted on unfavorably. The fifty-eight projects authorized aggregate 1,415,600 primary and 2,627,000 installed horsepower.

Of the projects, not including transmission lines, for which licenses have been approved up to Nov. 1, construction is now under way on the following:

	Primary Hp.
Henry Ford & Son Co., Hudson River, N. Y.	3,640
Niagara Falls Power Co., Niagara River, N. Y.	341,500
Southern California Edison Co., Big Creek, Cal.	165,000
Alabama Power Co., Coosa River, Ala.	21,760
Snow Mountain Power & Water Co., Eel River, Cal.	9,500
Western States Gas & Electric Co., American River, Cal.	6,400
Wisconsin-Minnesota Light & Power Co., Chippewa River, Wis.	10,000
Total	557,800

On several streams the power developments proposed are so involved with other uses, particularly with irrigation and navigation, that special investigations are necessary. This is particularly true of the St. Lawrence, the Columbia, the Deschutes and the Colorado Rivers, and is likely to prove true of the Kings and certain other streams in California. The Deschutes River investigation has been completed, and the Columbia investigation is now under way. The studies of the St. Lawrence will not be made until the International Joint Commission has reached its conclusions. The investigation of the Colorado River also has not been taken up by the commission engineers as yet, with the exception of a consideration of the Boulder Canyon project.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Burning Corn as Fuel.—The O'Neill (Neb.) electric light plant recently decided to try using corn for fuel in its generating plant and is said to be satisfied with the experiment, finding its heating qualities satisfactory and that a financial saving can be made.

Prosperity at Evansville, Ind.—The Southern Indiana Gas & Electric Company reports an output in one day recently at its North Side plant in Evansville of 9,000 kw. This exceptionally high figure indicates an improvement in industrial conditions. At no time during November was the daily output less than 8,000 kw. and the average was 8,700 kw.

San Francisco Electric League Sells Utility Stock.—A four weeks' stock-selling campaign in four of the electric utilities of northern California has just been closed by the San Francisco Electrical Development League. Twenty-one teams of eight men each made a thorough canvass of the members of the league and others who might be interested, the idea being to get as widespread holding of this stock as possible. The winning team in the contest took thirty-three orders, the second team taking twenty-nine. A similar contest was recently completed in Los Angeles by the Los Angeles Electric Club and was very successful.

Indiana Law Affecting Sale of Securities to Be Tested.—A suit appealing from a decision of the Indiana Securities Commission not to permit the North American Light & Power Company of Chicago to sell $200,000 worth of its preferred stock in Indiana, because of the commission's ruling that preferred stock exceeding double the value of common stock in a company may not be placed on sale in the state, was filed recently by the Chicago company. The plaintiff alleges that the Securities Commission is without authority to make an arbitrary rule such as that on the preferred-stock sale question, the company holding that a permit for sale of stock should be based only on the merit of the stock.

Latest Figures on Hydro-Electrical Development in Italy.—According to official figures just published by the Ministry of Public Works at Rome, there existed in Italy in 1915 altogether 329 hydro-electric plants with an individual capacity of more than 300 hp. and a combined capacity of about 933,000 hp. During the years from 1916 to 1920 the number of plants increased to 383 with a combined capacity of 1,152,120 hp. In construction at the present time there are fifty-four plants with a combined capacity of 359,210 hp., so that Italy will in the near future have 1,511,330 hp. developed water power for the generation of electricity. Adding to these larger installations the smaller ones with about 300,000 hp., there are available altogether power stations of a capacity of 1,811,330 hp.

New Alabama Power Project.—During the week ended Dec. 3 only one application was received by the Federal Power Commission. A. E. Killebreu of Newton, Ala., requested a preliminary permit to cover a power project estimated to furnish 1,200 hp. of primary power. It is the intention to install equipment with a capacity of 5,000 hp. and to build a dam 80 ft. high in the Choctawatchee River just above the town of Newton. The power is to be used for public utility purposes.

New Generating Station for Waukegan, Ill.—Plans are nearly completed for the construction by the Public Service Company of Northern Illinois of its new generating station at Waukegan, which will have an ultimate capacity of 220,000 kw. Construction is expected to begin early next year, when two units of 20,000 kw. each will be erected. Plans also call for the construction of transmission lines to connect the Waukegan station with the Northwestern station of the Commonwealth Edison Company in Chicago to provide for an interchange of energy in case of emergency.

France's Hydro-Electric Project.—The carrying out of hydro-electrical schemes in the Savoy provinces of France is providing some interesting technical problems which, according to the Paris correspondent of *Engineering*, are being satisfactorily solved. A characteristic example is the work undertaken by the Société de la Haute-Isère, which has driven a tunnel about 21,500 ft. long through Mont-Pourri in order to make available at Sainte-Foy-en-Tarentaise a 1,350-ft. head of water. The tunnel and the dam, which is at an altitude of 6,700 ft., are nearly completed, and it is expected that the power plant will be installed by the end of the present year and put into operation next spring. The power station at Sainte-Foy-en-Tarentaise will produce an average of 40,000 hp., of which two-thirds will be supplied to Lyons and the rest to Saint-Etienne. The current will be distributed under a tension of 120,000 volts over a distance of 140 miles. This is considered the most important electrical distribution scheme yet carried out in France.

Iowa and Wisconsin Universities Will Give Meter Courses in January.—The fourth short course for electric metermen, it is announced by the engineering extension department of Iowa State College, will be held at Ames, Iowa, on Jan. 3-6, 1922. The course will cover the fundamental principles on which meters operate, the electrical and mechanical features in the construction of meters and the installation, wiring, testing and adjusting of meters for single and polyphase service. There are no fees. The second session of the school for electric metermen in connection with the University of Wisconsin will be held at Madison during the week beginning Jan. 23. Last year's school was highly successful, and it is planned to conduct the work in much the same manner as it was conducted then, with such modifications as experience has shown desirable. One of these modifications, if the attendance justifies it, will be the division of those taking the work into two groups, one group including those who attended last year. These will be expected to do more thorough and advanced work. A fee of $10 to cover expenses is charged for this course.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

New York Electrical Society. — At the meeting of this society held last Wednesday, Dec. 14, Alfred O. Tate lectured on "The New Art of Electrolytic Waterproofing."

Material Handling in Its Relation to Port Development.—This will be the general topic of a meeting at the Philadelphia Engineers' Club on Tuesday, Dec. 20, held under the joint auspices of civic and engineering bodies, including the local section of the A. I. E. E. One of the papers will be by D. M. Petty, chief electrical engineer, Bethlehem Steel Company, who will discuss "Yard Electrification of Industrial Plant Railways." At a subscription dinner Dr. Julius Klein, director Bureau of Foreign and Domestic Commerce, will speak on "Our Plans for a Greater Foreign Commerce."

Edison Pioneers Amend Their Constitution.—In order to perpetuate their organization and thereby keep alive for future generations the activities and contributions to science of Thomas Alva Edison, the Edison Pioneers, who up to the present time have consisted exclusively of men who were intimately associated with Mr. Edison in the early days of his career, have revised their constitution to provide for a class of members to be known as "descendant members." This class will consist of the sons or daughters of actual members, only one such descendant being eligible for membership at a time. The Edison Pioneers are now sharing the rooms of the Association of Edison Illuminating Companies in the Engineering Societies Building, New York City, where it is the purpose of the society to gather together, if possible, models of early apparatus and other articles of historical and educational value in the conception and ultimate practical utilization of which the genius of Edison played a part.

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. — Pittsburgh Section, Dec. 19; Philadelphia Section, Dec. 20; Chicago Section, Jan. 27.
American Physical Society—Toronto, Dec. 27-30.
American Association for the Advancement of Science—Toronto, Dec. 27-31
A. I. E. E. Section Meetings—Atlanta, Dec. 29; Lehigh Valley, Jan. 12; Baltimore, Jan. 20; New York, Jan. 27.
Massachusetts State Association of Electrical Contractors and Dealers—Springfield, Jan. 5.
American Engineering Council — Washington, Jan. 5-6.
Western Association of Electrical Inspectors—Chicago, Jan. 17-19.
American Society of Civil Engineers—New York, Jan. 18-19.
Association of Municipal Electrical Utilities of Ontario—Toronto, Jan. 26-27.
Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.
New Mexico Electrical Association—Albuquerque, Feb. 13-14.
American Institute of Electrical Engineers—Midwinter convention, New York City, Feb. 15-17.
National Meter Committee, N. E. L. A.—Springfield, Ill., Feb. 15.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

State Must Not Tax Capital Stock Representing Property Outside Its Limits.—The Montana Supreme Court, in General Electric Company vs. Stewart, has held void a provision of the state law whereby it was sought to levy a tax on the entire capital stock of companies conducting a part of their business in the state. The court points out that such an exercise of taxing power has repeatedly been declared illegal by the United States Supreme Court as in violation of the Fourteenth Amendment to the United States Constitution.

Filing of New Suit by Utility Does Not Affect Consumers' Right to Rebate.—Refusing a petition for rehearing in re Lincoln (Neb.) Gas & Electric Light Company, whose attack on an ordinance rate as being confiscatory the United States Supreme Court had refused to sustain, that court declared that the trial court's jurisdiction to order a refund to consumers of charges in excess of the ordinance rate was not affected by the utility's bringing a new suit against the city again attacking the ordinance rate, nor by a restraining order issued therein, as such new suit could properly have effect only as to the then future operation of the ordinance and could not affect the period covered by the former suit; nor was the obligation to reimburse consumers affected by the sufficiency or insufficiency of the supersedeas bond filed by the company to cover such a necessity. (42 S. C. R. 2.)*

Effect of Nullifying Statutory Rate.—The New York Public Service Commission may approve a schedule of rates when the legislative maximum has been declared confiscatory, since there then exists no lawful maximum rate. This is the holding of the New York Court of Appeals in Morrell vs. Brooklyn Borough Gas Company, which thus reverses the judgment of the Appellate Division of the Supreme Court. (See ELECTRICAL WORLD, Feb. 26, page 508.) In the latter judgment an order for an injunction against the company was upheld and the action of the Supreme Court, Special Term, in itself fixing a rate of $1.15 was sustained. The Court of Appeals says: "We find nothing in the laws or in authorities to justify such action. The Public Service Commissions law covers the whole question. The company may file its own schedule of rates and change of rates. The Public Service Commission on complaint or of its own motion may modify the charges. Here, on application of this company, the commission fixed the rate at $1.40. It is only where a rate has been fixed by statute that the commission cannot increase it. The only law was that of 1916, which had been declared null and void, so that there was not this limitation upon the commission."

"Passion and Prejudice" Affect Seattle's Municipal Plant.—A great divergence in the estimate of land values appeared when the City of Seattle brought suit against the Bingham Investment Company in eminent domain proceedings to condemn land for its hydro-electric light and power plant. A plot valued by the city at $3,000 was held by the company at from $17,000 to $50,000, and a jury returned a verdict for $27,500. The court found this amount "excessive in the sum of $13,750" and held the verdict to be "the result of passion and prejudice against the petitioner," ordering a new trial. This decision has been upheld by the Supreme Court of Washington, despite the fact that both sides appealed from it, the investment company on the ground that the jury's finding was of a binding nature and the city because the court did not "include in its order for a new trial an affirmation of legal points which it desired to have sustained." (201 Pac. 300.)

Exemption of City-Owned Utilities from Control of Illinois Commission Upheld by Supreme Court. — The Supreme Court of the United States has upheld the Supreme Court of Illinois in its decision that the public utilities act of that state does not apply to city-owned utilities, they being exempted under a section of the public utilities act as well as under the municipal ownership act (Springfield Gas & Electric Company vs. City of Springfield). The United States Supreme Court says: "The plaintiff's argument shortly stated is that in selling electricity the city stands like any other party engaged in a commercial enterprise and that to leave it free in the matter of charges while the plaintiff is subject to the public utilities board is to deny to the plaintiff the equal protection of the laws. But we agree with the Supreme Court of the state that the difference between the two types of corporation warrants the different treatment that they have received. The private corporation whatever its public duties, is organized for private ends and may be presumed to intend to make whatever profit the business will allow. The municipal corporation is allowed to go into the business only on the theory that thereby the public welfare will be subserved. So far as gain is an object it is a gain to a public body and must be used for public ends. Those who manage the work cannot lawfully make private profit their aim, as the plaintiff's directors not only may but must. The Supreme Court seems to interpret the municipal ownership act as limiting the charges allowed to what will be sufficient to meet outlays and expenses of every kind, thus emphasizing the purely public nature of the interests concerned and excluding the latitude for wrong that the plaintiff fears. . . . The trouble with the plaintiff's argument is that it attempts to go behind the interpretation that the Supreme Court has given to the acts concerned and to overwork the delicate distinction between the private and public capacities of municipal corporations. It is unnecessary to refer to the numerous cases upon classification by state laws in order to show that the distinction here is very far from being so arbitrary that we can pronounce it bad." (42 S.C.R. 24.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Reasonableness of Company Rules.—Passing upon various regulations of the Luzerne County Gas & Electric Company to which objection had been made, the Pennsylvania Public Service Commission upheld a rule reserving to the company the right to reject any application and also the rules in regard to deposits and guarantees. A rule giving the company the right to discontinue service without notice and to remove its equipment in case of failure to pay bills was modified to cover only bills directly related to the service rendered, and the commission asserted that the right of shut-off should be exercised subject to reasonable notice to the consumer. An objection to a clause making the customer liable for damage to the company's property as a result of misuse or neglect was overruled.

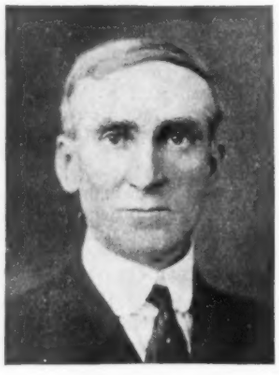
Off-Peak Power Rate Approved.—An increase in the power rate to the East Providence Water Company and the establishment of a new power rate for the East Greenwich Water Company are included in tariffs filed by the Narragansett Electric Lighting Company with the Public Utilities Commission of Rhode Island and approved by that body. The rate to the East Providence company is increased from 4 to 4½ cents per kilowatt-hour for the first 25,000 kw.-hr. per year. The minimum charge of $1,000 per year still remains. The rate established for the East Greenwich company is 4½ cents per kilowatt-hour per year for the first 20,000 kw.-hr., and existing power rates in the regular tariff are to govern the excess power used. The minimum charge per year is $1,000. The rate is made by the Narragansett company upon the condition that the water concern does not use power during the peak load of the power company.

Working Capital and Issues of Stock.—In permitting the Haverhill Gas Light Company to issue additional capital stock of which the proceeds are to be applied to the payment of floating debt, the Massachusetts Department of Public Utilities quoted a former decision in which it said: "In established and prosperous companies, with an unquestioned surplus, the board has been of the opinion that working capital should be provided out of surplus or temporary debt rather than by the issue of new stock because under such conditions the necessity for such issue is not apparent. For these reasons no provision for this item is made in this decision, but if experience shall later prove that such reasonable necessity exists, the request for the same can then be renewed." Adhering to this position, the Massachusetts body criticises the inclusion in the contemplated stock issue of a sum to make up a deficit in working capital, especially in view of the present market conditions, which should make new issues of stock as small as exigencies permit.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Dexter S. Kimball, dean of the College of Engineering, Cornell University, has been elected president of the American Society of Mechanical Engineers for the year 1922. Dean Kimball was born in New River, New Brunswick, Canada, in 1865. He was graduated from Leland Stanford, Jr., University in 1896 with the degree of A.B. In 1913 he received the degree of mechanical engineer from the same university. He served his apprenticeship with Pope & Talbot, Port Gamble, Wash., and in the shops and engineering department of the Union Iron Works, San Francisco. In 1898 he became designing engineer for the Anaconda Mining Company. For three years he served as assistant professor of machine design at Sibley College, Cornell University, after which he became works manager of the Stanley Electric Manufacturing Company, Pittsfield, Mass. In 1904 he returned to Cornell University as professor of machine design and construction, and since 1915 he has occupied the chair of industrial engineering. He became dean of the College of Engineering of Cornell in 1920. Since 1911 Dean Kimball has been a member of the Council on Industrial Engineering, New York State Department of Education. He is also a member of the Society for the Promotion of Engineering Education and the Society of Industrial Engineers. He is vice-president of the Federated American Engineering Societies. Dean Kimball is the co-author with John H. Barr of "Elements of Machine Design" and the author of "Industrial Education," "Principles of Industrial Organization," "Elements of Cost Finding" and "Plant Management," as well as of many contributions to the technical press.



D. S. KIMBALL

Prof. Harold J. Lockwood has been appointed professor of electrical engineering in the Thayer School of Engineering, which is connected with Dartmouth College, Hanover, N. H., to fill the vacancy caused by the resignation of Prof. F. E. Austin.

James B. Brokaw has been recently appointed manager of the Grand Ronde division of the Eastern Oregon Light & Power Company, with headquarters at La Grande, Ore. Mr. Brokaw brings to this company a wide experience of the electrical industry, since he had served prior to 1921 as manager of the Minot (N. D.) division of the Northern States Power Company and for more than eight years as local manager of the Idaho Power Company at Blackfoot, Idaho.

Allan D. Colvin has been appointed general manager of the Hartford (Conn.) Electric Light Company, succeeding E. F. Lawton, who has resigned his post on account of continued ill health. Mr. Lawton still retains his connection with the company. Mr. Colvin was born at Troy, N. Y., in 1883 and was graduated in 1906 from the Rensselaer Polytechnic Institute. From 1906 to 1907 he was personal assistant to Dr. W. L. Robb, consulting engineer, Troy, and from 1907 to 1909 he was assistant superintendent of the electrical department of the Troy Gas Company. He then served two years as assistant in physics and electrical engineering at the Rensselaer Institute. Mr. Colvin was called to the Hartford Electric Light Company in 1911 to become assistant to the general manager and a year later was made assistant general manager. During the absence of Mr. Lawton in 1919 and 1920 he was acting general manager. Mr. Colvin is well known in New England central-station circles, is active in the New England Division of the N. E. L. A., and is a member of the committee on inductive interference.

A. D. COLVIN

Dr. B. E. Eldred of New York has recently been awarded the Elliott Cresson gold medal by the Franklin Institute, Philadelphia, for his development of the low-expansion leading-in wire for incandescent electric lamps.

F. R. Winders, who becomes a member of the engineering force of the National Electric Light Association at the New York headquarters this week, is a graduate of the University of Illinois, which conferred the degree of electrical engineer upon him in 1905. He spent five years with the Arnold Company on construction work and from 1910 to 1914 was with C. W. Humphrey in his consulting and construction work dealing with utility and other problems. From 1914 to 1919 Mr. Winders was with the L. E. Meyers Company, engaged in construction and operation of utility properties in the Lake Geneva territory in Wisconsin and later at Ashland and Ironwood, Mich. In 1919 he went to the engineering department of the Railroad Commission of Wisconsin, with which he remained until Sept. 1, 1921, when he undertook some work in Ohio in connection with the formulation of rules which a joint committee of the Ohio utilities are working out for recommendation to the commission. Mr. Winders' new activities will consist primarily of field work in the study of the inductive-interference problem, which is now being actively discussed in a very large number of states.

F. R. WINDERS

Walter S. Dickson has been appointed to the staff of the Society for Electrical Development. Mr. Dickson's work for the society will consist in part in gathering and interpreting statistics and other information of value to members. Mr. Dickson brings to the society a broad experience in engineering and research work. He has made extensive business trips in this country and throughout South America in the interest of large engineering projects. He has given a great deal of time to further the work of the several national technical societies of which he is a member. His activities have been associated with electrical manufacturing interests, public utility properties and prominent consulting electrical engineers. During the present period of reconstruction Mr. Dickson has done active work on engineering committees dealing with large engineering problems.

C. F. Gottschalk, for the past twelve years assistant manager of the George Worthington Company, has been appointed sales manager of the Frankelite Company, lighting fixture manufacturer, Cleveland, Ohio.

A. A. Albaugh, formerly general superintendent of the Jacobson Manufacturing Company, has been appointed vice-president and general manager of the Barnhart-Davis Company, Warren, Pa., manufacturer of specialties.

L. S. Montgomery, who has joined the New York sales organization of the Garland Manufacturing Company, successor to the Safety-Armorite Conduit Company of Pittsburgh, has been associated with the electrical industry for about fifteen years with electrical jobbers, central-station companies and electrical manufacturers. Mr. Montgomery was the first sales representative of the National Metal Molding Company in the South. He entered that field in 1909 and later established and managed the district sales offices of the company in Atlanta, Pittsburgh and Buffalo. While in Buffalo he was also sales representative for the Dominion of Canada. In June, 1916, after the National Guard had been mobilized for the Mexican border disturbance, Mr. Montgomery enlisted as a private with Troop I, First Cavalry, and was in active service at McAllen, Tex., with that unit for more than ten months. After returning from the Mexican border he joined the organization of the American Conduit Manufacturing

L. S. MONTGOMERY

Company in charge of its sales and warehouse organization in New York City. This position he resigned a few months later to re-enter the army for the World War, enlisting as a recruit at Fort Slocum in December, 1917. He was assigned to the Corps of Engineers and when discharged in December, 1918, was a captain of engineers in command of Company F, Seventh Engineer Training Regiment, and regimental director of athletics of the Seventh Engineer Training Regiment, Camp A. A. Humphreys, Va. After being discharged Mr. Montgomery joined the organization of the Fairbanks Company as manager of its electrical division and during that connection was in charge of electrical merchandising activities of that company, installing industrial electrical supply departments in its branches at Baltimore, Birmingham, New Orleans and St. Louis. Mr. Montgomery was born in Concord, N. C., Feb. 26, 1887. He is a member of the Army and Navy Club, New York, and the Cavalry Post of the American Legion.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, and Gen. Guy E. Tripp, chairman of the board, have been elected directors of the Radio Corporation of America.

R. W. Everson, formerly manager of the merchandising department of the Westinghouse Electric International Company, has left for Mexico City, where he has been assigned to the Mexican office of the company. Mr. Everson has been connected with Westinghouse interests for the past twenty-five years. For several years he had charge of the export activities in the supply department, and in 1906 he was transferred to the Chicago district office of the Westinghouse Electric & Manufacturing Company, where he specialized on syndicates. In 1919 he was made manager of the merchandising department of the International Company.

Obituary

Martin H. Stellman, general manager of the Westerly (R. I.) Light & Power Company and the Mystic Power Company, died on Nov. 17, after a long illness. Mr. Stellman was born in Providence Dec. 21, 1875. From earliest boyhood his interest was held by things electrical, and it was along the line of practical electrical work and electrical engineering that the greater part of his active years was spent. Besides

M. H. STELLMAN

being general manager of the Westerly Light & Power Company and the Mystic Power Company he had a number of other business interests.

Frank Chittenden Peck, for fourteen years an electrical engineer with the Electric Service Supplies Company, died on Nov. 12. Mr. Peck was born in Scranton, Pa., in 1877.

H. R. Frost, formerly treasurer and general auditor of the Northern States Power Company, died Nov. 23 at his home in Wichita, Kan. Mr. Frost, who had been a member of the Byllesby organization for many years, serving as local auditor, traveling auditor and member of the auditing department at Chicago, was forced to retire from active work in 1919 because of ill health.

Sir Charles Douglas Fox, an eminent British civil engineer, who was also a member of the Institution of Electrical Engineers and who was among those instrumental in bringing into being the British Engineering Standards Committee, died in London last month at the age of eighty-one.

R. N. Hodgson, of the W. E. Moore Company, Pittsburgh, was instantly killed on Nov. 30 by being run over by a train. Mr. Hodgson had been in the central station business for the past eighteen years and was widely known throughout the Eastern States. He began his service in the industry with the West Penn Electric Company in the power sales department, finally becoming power sales engineer. He was later connected with the Westinghouse Electric & Manufacturing Company as special motor application engineer and with the General Electric Company as engineer of motor application. His last work in the electrical industry was as general manager of the Binghamton (N. Y.) Light & Power Company.

Frederick A. Keyes, well known to the electrical industry as the sales manager of the electrical and wire-rope department of the New York office of the American Steel & Wire Company, died on Saturday, Nov. 26. Mr. Keyes was born in West Boylston, Mass., in 1864. He entered the service of the Washburn & Moen Manufacturing Company at Worcester, Mass., at the age of sixteen and continued his service with that company and its successor during his entire lifetime. In 1892 he was placed in charge of the Philadelphia office of the Washburn & Moen company. In

F. A. KEYES

1899, when that company was absorbed by the American Steel & Wire Company, he was given charge of the electrical and wire rope department in New York City, covering the Atlantic Coast States, and he conducted that important department with marked success until his death. He was a man of very high ideals and fine character.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Southeastern Collections Better, but Credits Remain Tight

ALL electrical firms in the Southeast report their collections as materially improved, though a large number of outstanding accounts remain to be liquidated. The tendency of the rural population to put the proceeds from agricultural products in their pockets rather than to liquidate their old debts is causing an undesirable situation in the smaller towns, which of course is reflected in jobbers' accounts with clients in such centers. Creditors hesitate to push such individuals as hard as conditions warrant for fear that bankruptcy would result in a large number of cases, thus causing the creditor to lose more heavily than if collections are handled on a less drastic basis. The increase in cash business and in the payment by debtors in the larger communities is going far toward the liquidation of outstanding accounts in the cities. Little credit is being extended by the jobbers, except to thoroughly reputable and well-established firms, and this is usually on the sixty-day basis.

Cedar Poles Denied Free Entry

THE collector's assessment of duty at the rate of 10 per cent ad valorem on merchandise imported from Canada and described as cedar piling or peeled cedar poles is affirmed in a ruling by the Board of United States General Appraisers. This decision overrules protests of the United Railway Customs Bureau. The goods, the subject of this controversy, were entered at Pembina, N. D., and classified under Section 170 of the existing tariff law. Claims were made for free entry under paragraph 647 of the tariff.

Foreign Export, Rail Electrification and Water-Power Figures Being Compiled

DETAILED figures as to the current exports from the fifteen countries which engage extensively in the manufacture of electrical goods are being compiled by the electrical division of the Bureau of Foreign and Domestic Commerce. An effort also is being made to procure figures as to the production of the more important foreign manufacturing concerns. A compilation is being made of all water powers in the world whose early development is likely. This survey is well under way. A similar survey with regard to railroad electrification is about to be begun. In the gathering of these data the department has had the advice of a special committee of the Electrical Manufacturers' Council.

Farm-Lighting Sets and Central-Station Service

THAT farm-lighting sets pioneer the way for later service by central-station companies was vigorously affirmed recently by a prominent distributer of this class of equipment who was discussing the trade outlook with a representative of the ELECTRICAL WORLD. It was pointed out that the use of these sets generally involves either regular 110-volt wiring or heavier copper for a 32-volt or other low-potential utilization of energy in farm buildings, and that the standards of insulation adopted often enable service from the local utility to be provided with little additional outlay. Where the farm-lighting unit is purchased and installed for service along a highway or branch road having no central-station service, it tends, in the opinion of this distributer, to stimulate other purchases in the neighborhood and ultimately to bring about a community state of mind favorable to meeting the extra costs of central-station line extensions, where these costs are a limiting factor. In territory just beyond existing lines, it was stated, these small sets provide an interim service of value. Sales of such sets by actual demonstration in the evening from a light gasoline motor car or truck from which a duplex cable can be run into the farm buildings and the "sales talk" backed up by modern lighting and power apparatus are advocated.

November Building Overtops Last Year

BUILDING contracts awarded during November in twenty-seven Northeastern states, according to the F. W. Dodge Company, amounted to $192,311,000. This is 45 per cent greater than in November, 1920, and 14 per cent under October of this year, although the average per business day last month was only a little under October. Normal decline from October to November is 24 per cent. The fact that construction activity is holding up at such a high level during the winter gives promise of unusual construction in 1922. The greatest fear now is that the supply of building material will be unable to keep up with actual construction.

Metal Market Situation

A VERY important factor in the copper market has been the rise in foreign exchange. The mark has doubled in value and German demand, which has been good all along, may be expected to improve accordingly. The pound sterling has established a new high record for the last two years, and although copper is quoted at London £1 lower, it is actually selling at higher equivalent prices than last week.

Domestic demand is varied, inquiries coming from electrical manufacturers, wire mills, brass manufacturers, etc. The price drift is steadily upward. Large producers ask 14 cents per pound for electrolytic for January and first-quarter delivery. Predictions of 15-cent copper before Jan. 1 seem to be coming true.

NEW YORK METAL MARKET PRICES

	Dec. 5, 1921	Dec. 12, 1921
Copper	£ s d	£ s d
London, standard spot	67 5 0	66 17 6
	Cents per Pound	Cents per Pound
Prime Lake	13.75	13.75
Electrolytic	13.62½	13.62½
Casting	13.00	12.87½
Wire base	15.00—15.25	15.00—15.25
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	4.55	4.50
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	9.00	9.00
Zinc, spot	5.40	5.15—5.20
Tin, Straits	31.75	33.50
Aluminum, 98 to 99 per cent	19.00	19.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.50 —11.37½	11.50 —11.75
Brass, heavy	5.00 — 5.50	5.00 — 5.25
Brass, light	4.75 — 5.25	5.00 — 5.12½
Lead, heavy	3.75 — 4.12½	3.75 — 4.12½
Zinc, old scrap	2.50 — 2.75	2.50 — 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

SEASONAL business during the past week has developed well, but the general business of both manufacturers and jobbers has been restricted by the fear of enlarging inventories. Contractor-dealers have found a large volume of business in the residence construction permitted by generally mild weather and are reported to be buying in good quantities from jobbers.

Chicago reports a good call for vacuum cleaners, washing machines and wiring materials. Meters are selling well in St. Louis, where the central-station company has gained an average of 1,000 customers per month for the last year. Boston reports meters down 10 per cent, and New York jobbers have received notice of a 5 per cent cut from manufacturers of rigid iron conduit.

NEW YORK

Holiday trade is increasing in volume and jobbers report that this business is picking up rapidly. Individual orders, however, are not as large as last year, and dealers in this section state that this is because of a certain amount of stock carried over from last year. Jobbers appear to feel that the Christmas business this year will show up somewhat better than was at first expected.

The demand for wiring material holds up steadily, except for the fact that orders are for small quantities. This is explained, of course, by the desire of the contractors to keep their stocks as low as possible until the first-of-the-year inventories have been made. Jobbers, generally, state that they expect business to continue at about the present level until after the middle of January, when another step forward in the improvement of conditions is looked for.

One important price change was noted this week. Leading manufacturers of iron conduit have reduced the price on this material 5 per cent off the previous quotations. A new card has not as yet been issued.

Conduit.—An additional discount of 5 per cent on rigid iron conduit went into effect this week. Jobbers have not issued a revised list of prices to conform with the new discount, but are quoting 5 per cent off on the following: For ½-in. black pipe in 2,500-ft. lots, $48.29 to $48.90; ¾-in., $62.06 to $62.70, and 1-in., $88.21 to $89.32 per 1,000 ft. The same discount applies to galvanized pipe, which for the same sizes is quoted at $53.19 to $53.97, $68.61 to $69.58 and $98.19 to $99.47 per 1,000 ft. Demand is fair with most orders for small quantities. Jobbers' stocks are ample to meet the demand.

Rubber-Covered Wire.—Little change has been noted in conditions in the wire market. Demand is moderate and few large orders are being placed. Jobbers are quoting $6.50 to $6.60 per 1,000 ft. for No. 14 rubber-covered in 5,000-ft. lots. It is understood that in some cases where large stocks are on hand these prices have been shaded slightly on orders for over 5,000 ft.

Flexible Armored Conductor.—Demand for this material continues active and jobbers' stocks are moderate. No change in price has been reported. No. 14, two-wire, single-strip, was quoted at $44.50 to $46 per 1,000 ft., and double-strip at $46.50 to $48 per 1,000 ft. in that quantity.

Metal Molding.—Price on this material has remained unchanged. The three-wire size is quoted at $5.60 per 100 ft. Demand is light and jobbers' stocks are small.

Loom.—Because of the small demand stocks of this material are kept as low as possible. Both the 3/32-in. and the ⅛-in. sizes are quoted at $18 per 1,000 ft. in lots of that quantity.

Appliances.—Jobbers report an active demand for the smaller devices, and the holiday trade is developing rapidly. Christmas-tree sets are moving well, and present indications are that the holiday business may exceed estimates made a month ago.

CHICAGO

Another week has passed with steady business in electrical lines. Dealers in general report an active trade in wiring materials and a growing call for washers, vacuum cleaners and silk lamp cord. Since the public is showing keen interest in price lists, dealers are busy increasing sales efforts to obtain orders.

Christmas tree lights are also moving strongly, and stocks in most cases are conservative since dealers are not risking any such carry-over as occurrred last year. Dealers are optimistic as to total Christmas trade and feel that the volume for 1921 will closely equal that of 1920.

Wire.—Rubber-covered No. 14 is still selling at $6.60 to $6.75 per 1,000 ft., in 5,000-ft. lots, although weatherproof has advanced from 16½ cents a pound in 1,000-lb. lots to 16¾ cents in a few cases. Bare wire has also strengthened, the base being 16¾ to 16⅞ cents. In general, wiring materials are selling well and no shortage of wire has been reported.

Conduit.—No change in price has been recorded in this material, ½-in. black pipe still selling for about $47 per 1,000 ft. in 5,000-ft. lots. Dealers report a steady movement and their stocks are ample.

Flexible Armored Conductor.—Demand for this also has been active but no reduction in price has been announced. No. 14 two-wire, double-strip, still sells between $45 and $48 per 1,000 ft. in 5,000-ft. lots. Stocks on hand are sufficient to supply the trade.

Lamp Cord.—Silk cord seems to be the best-moving article because of the activity in portable appliances and lamps, while cotton, twisted, is going fairly well also. Silk No. 18, 3/32-in. insulation, sells around $33 to $35 per 1,000 ft., while the same cord with cotton insulation costs about $28 to $30. The cheaper grade of cotton, twisted, 6/64-in. insulation, is available at about $13 per 1,000 ft.

Cleaners and Washers.—Intense sales efforts by a large number of dealers are producing results. Many dealers are reporting good sales with deliveries scheduled just in time for Christmas.

Flashlights.—The fall trade is steady and the three-cell flashlight is selling the best. Replacements of batteries are drawing excellent trade and jobbers report their stock ample.

High-Tension Equipment.—Numerous inquiries for 33,000-volt equipment for extending feeder circuits by public utilities for farm lighting were reported this week by one high-tension manufacturer. Another inquiry for a 100,000-volt extension for supplying power to coal mines was also reported. Another manufacturer has received an order for 400 25,000-volt fuses from Australia and also for fifty disconnecting switches and fuse mountings of the same voltage from Texas.

Christmas-Tree Outfits.—Dealers report activity and prices vary from $1.75 to $2.50 for an eight-light carbon-lamp outfit to $2.75 to $4.75 for a tungsten-lamp outfit for the same number of lights. Stocks are ample for the trade.

BOSTON

Little change is evident in the volume of trade this week. The desire to limit inventories is undoubtedly holding back some orders, for stocks are well liquidated in most lines and ordering is confined mainly to current requirements. Operations are about 75 per cent of capacity in the cotton industry; the woolen and worsted mills are running at 97 and 92 per cent of rating, respectively, and rubber plants are busy. Conditions are spotty in paper mills, and the shoe industry is being hampered by labor difficulties. Building contracts in New England, Dow Service reports, totaled

$178,933,000 from Jan. 1 to Dec. 1, or 17 per cent below the corresponding five-year average, while the November contract total of $18,404,000 was only 1 per cent below November, 1920. It is reported that a million-dollar car order has been placed with the Laconia (N. H.) Car Company by the Boston & Maine Railroad. Prices stiffened Monday on insulated wire, while switchboard meters are off about 10 per cent. Optimism is widespread in viewing prospects for 1922 business.

Lamps.—The excellent trade of the last five months continues. Stocks are satisfactory, prices firm and demand well distributed. Sign lighting is fairly active.

Meters.—Meters for switchboard service are down about 10 per cent in price in at least one prominent make. Residence meters are firm and trade only moderately good. Deliveries are very easily made.

Appliances.—Distributers are not very enthusiastic over sales in the first half of this month, but last-minute orders of the lighter devices for table and boudoir service are expected to swell the total for December. Washing machines are moving slowly and cleaners are a little more active. Air heaters are making a reasonably good showing, but unprecedentedly mild weather has hurt this class of trade. Retail trade in socket devices is accelerating seasonably.

Wire.—The long-expected advance on rubber-covered wire appeared on Monday's price sheets, No. 14 in 25,000-ft. lots mounting to $6.50 per 1,000 ft. For 5,000-ft. lots, $6.75 per 1,000 ft. was the new figure. Trade is spotty, some jobbers reporting fairly good sales. Weatherproof wire is also firmer, the new base being 16½ cents. Prospective buying by storm-hit utilities to replace wire drawn from emergency stocks is not far off.

Insulators.—High-tension equipment is in light demand, but buying of insulators for distribution lines is fair. Enormous quantities of telephone-line material are being consumed in post-storm repair work. Freight shipments are getting somewhat slower on insulators.

Linemen's Tools.—The demand has flattened out, leaving low or exhausted stocks. Early buying by distributers is forecast.

Loom and Flexible Armored Conductor.—The market is dull in loom, but much better business is anticipated with the turn of the year. Prices are steady. Flexible armored conductor is moving well, and No. 14 single-strip sold at Boston this week at $45 per 1,000 ft., in 1,000-ft. lots.

ATLANTA

The preinventory period has somewhat reduced the volume of business, the orders received being of sufficient size only to carry over to the first of the year, while restocking for Christmas specialties has not begun to make itself felt. One of the largest jobbers reports that his volume of business for the entire year to date is satisfactory, being somewhat below that of 1920 but on parity with that of 1919. Keen competition has served to reduce the margin of profit in nearly all lines, and in some specialties the tendency to unload overstocked articles is taking away all profit in this line. Orders from central stations are being received in very satisfactory volume, replacements and expansions long deferred being responsible for this condition. Orders from smaller contractors continue to hold up fairly well, and purchases by the larger contracting firms are on the increase. Indications are that by early spring a very material stability will be in evidence throughout the jobbing line. Engineering firms report considerably increased interest on the part of industrial plants, both present and proposed, but little definite business is being closed up, as there seems to be a tendency to hold over final decisions until after the first of the year. This is not true in the activities of the ice industry, there being considerable new construction under way, together with changes in old plants to the raw-water type.

Turbo-Generator Sets.—A number of satisfactory sales are reported recently, while inquiries from central-station companies and large industrial concerns are the heaviest in many months. Most of the sets are for sizes of 1,500 kw. and up, the largest being for 20,000 kw. Shipments are satisfactory.

High-Tension Circuit Breakers.—There has been considerable activity in this line for the past few weeks, several large orders having been received while others are pending. This is in keeping with expansions to be noted in the central-station field.

Conduit.—Orders continue to hold up very nicely, particularly in the more popular sizes of 2-in. and smaller, with the demand about evenly divided between the black and galvanized. There has been no change in price since September and jobbers' stocks are in good shape.

Schedule Material.—A general sluggishness is to be noted, due probably to the recent falling off in the small industrial business. Jobbers' stocks are heavy with a resultant instability in prices.

Portable Lamps.—The expected movement in this line has failed to materialize to date, though prices are low. It is probable that there will be further price cuts in certain lines in which dealers find themselves overstocked, unless some sales materialize shortly.

Printing-Press Equipment.—Orders and inquiries throughout the section are uniformly good, the single-phase apparatus of 10 hp. and under being particularly active. Local stocks are in fair to good shape.

Electric Hoists.—A revival in demand is to be noted, several satisfactory orders being received, while construction and dock work is stimulating inquiries for delivery shortly after the first of the year.

Wire.—The recent slight increase in price seems to have stabilized the market, especially for small quantities. Competition on carload lots, however, is very keen. Both weatherproof and rubber-covered are moving quite satisfactorily in the smaller sizes, but there is little demand for No. 2 of larger sizes.

ST. LOUIS

Holiday buying is becoming brisker but has not yet reached the proportions that retail dealers expected for this period. However, warm weather has held back the holiday buying spirit and substantial improvement is anticipated from now on. Jobbers report that there are few replacement orders of holiday goods. The early buying depleted stocks in a number of appliance lines, but these have been refilled. The carry-over in all lines will be light, yet sufficient to enable jobbers to give proper service.

Improved buying from the industrials, especially the railroads and the steel mills, was felt last week. Utilities were heavier buyers of meters, transformers and pole-line hardware. The recent reductions in poles have slightly stimulated sales, but no large orders are expected before spring. Glass and porcelain insulators are moving better. An increase in the prices of rubber-covered wire is announced, but the change has not been in effect long enough to show its results in the demand. The improved buying in these items resulted in a better volume of business for the week.

A representative jobber reports that business to date has been about 30 per cent less than last year, but that 20 per cent of this is due to decreased prices. Profits, however, have not been satisfactory, and this is attributed to the highly competitive status of the electrical goods market.

Wire.—An increase in price of rubber-covered wire of about 7½ per cent has just been announced, but prices have not yet been established. Though this has been expected for some time, there has not been much tendency on the part of contractor-dealers to stock up. Jobbers' stocks are also on a moderate basis. No. 14 has virtually the entire demand in rubber-covered. Fairly good movement continues in bare and weatherproof, the base prices of which are 15 cents per pound and 15½ cents per pound respectively.

Poles.—The following prices have been established for Northern white cedar poles in carload lots, f.o.b. St. Louis: 6-in., 30-ft., $5.85; 7-in., 30-ft., $8.75; 7-in., 35-ft., $14.35; 7-in., 40-ft., $18.30; 7-in., 45-ft., $21.30. Since these lower prices were made effective there has been some improvement in demand, though there are no orders for large amounts.

Utilities are buying only for small extensions and stock replacements.

Cross-Arms.—Sales show some improvement and there are a number of attractive inquiries. Representative prices on fir arms, size 3¼-in. x 4¼-in., are: 3-ft., $40.43 per 100; 4-ft., $53.90; 6-ft., $80.86; 10-ft., $135, all f.o.b. St. Louis.

Pole-Line Hardware.—Improved sales have been noted since the reduction around November 1. Stocks are sufficient to take care of all small orders, but factory shipment would have to be made for any order of magnitude.

Insulators.—Better demand is experienced for both glass and porcelain. Local stocks are complete in all standard sizes up to 6,600 volts, and immediate factory shipment can be made in any standard size of higher voltage.

Meters.—Utilities throughout the entire territory are making substantial purchases. The St. Louis central-station company for the past year has gained more than 1,000 customers per month, necessitating large orders, principally of the residential and commercial lighting type. Industrials are buying recording meters in good volume, especially demand meters, for more economical factory operation. Jobbers' stocks are well in line with the requirements. Buying is done on a very conservative basis.

SAN FRANCISCO

As the holidays draw nearer business conditions seem better, although much business is of seasonable character. In making their estimates of 1922 business local jobbers and dealers are figuring on anywhere from 75 per cent to 100 per cent of that of the present year.

Rubber-Covered Wire.—For the past few days salesmen have been eagerly seeking rubber-covered wire business, on the rumor of an advance. This advance is about 5 per cent and brings No. 14 single-braid solid in 5,000-ft. lots to an approximate price of $7.40 per 1,000 ft. There is a 5 per cent higher price in coil lots. Local stocks are working down nicely from the overstocks prevalent during mid-year. Several good dealer orders, in some cases amounting to 100,000 ft. have been reported.

Medical Apparatus.—Such electrical devices as violet-ray machines are in demand, there being prevalent much sickness caused by the long dry spell. The best seller is the twenty-five-dollar type of machine equipped with a general applicator. There is a steady call also for vibrators, although this call is usually for a few machines at a time, probably because of the small inducement of only 50 cents per vibrator offered for dozen lots.

Christmas-Tree Outfits.—Jobbers' stocks have been received and generally distributed on orders dating back to spring. There is a much better call this year than last, probably because of the stimulating effect of new styles. A new outfit composed entirely of fancy lamps retailing complete for $17 is being widely displayed. Standard outfits are listing at $5 for eight-light series sets. Complete, costing the dealer $3 in single lots and $2.50 each in ten lots, and with special prices quoted on orders of 500, which, however, are very scarce. The fifty-lot requirement has been discontinued in line with the determination to give maximum prices on comparatively small amounts.

Holiday Goods.—All things considered, the electrical gifts for the holidays will be sold in a much higher proportion this year than previously. The recent industrial show held in San Francisco, in which about twenty dealers maintained booths, displaying socket appliances, gave satisfactory evidence that the buying public will pay more attention to the gift possibilities of electrical appliances this year. Furthermore, the Christmas campaign was not started too soon this year, but has been allowed to accumulate its own impetus, and many dealers reported better business on Dec. 1 than they had during holiday week last year. However, this business is nearly all for outfits and small heating and cooking appliances, and business on the larger appliances is reported slow. Nearly all prospective customers say that they will defer their purchases until after the first of the year.

SALT LAKE CITY—DENVER

In an effort to get the Interstate Commerce Commission to revert to the freight rates that prevailed in 1917, five governors of Intermountain states are preparing data to show that the present rates are stifling progress and discouraging reclamation work. The sum of $1,500,000 will soon be distributed by the Sugar Beet Finance Corporation. This will be a boon particularly to country banks and will enable growers to square up many of their debts. There is less demand for loans than has prevailed for some time, and it is expected that there will be a slight easing of the money market. Holiday buying is proceeding at a good rate, with every conceivable kind of merchandise being urged as appropriate for gift giving. Electrical merchants are vigorously pushing their wares, under the slogan "Make this an electrical Christmas." There is a fair demand for hollow ware, flashlights and vacuum cleaners. A mild, open December is permitting considerable residence construction, making business fair, at least, for energetic contractor-dealers. Jobbers are able to appraise the year 1921 with fair accuracy. That the jobbing business in electrical supplies has fallen off more than 30 per cent seems quite certain.

Pole-Line Material.—No department of the electrical jobbing industry here has suffered a greater shrinkage. There has been scarcely a construction project of any size and the demand for materials has been very small.

Switchboards.—Manufacturers of switchboards report a quiet period. At no time during the year have they run to production capacity. High cost of materials and labor keep the price well up.

SEATTLE—PORTLAND—SPOKANE

Evidence of the permanent character of the business revival which set in during the late summer and fall is reported from all sections of the Northwest. Shipping at the ports of Seattle and Portland has increased so rapidly this fall that it has been found necessary to increase terminal and drydock facilities. Building is active throughout the Northwest, and several large projects have been announced lately, one of them being a ground fill at Portland for a large Union freight terminal. The port of Portland plans extensive harbor improvements in connection with the terminal project. The employment situation shows improvement. Lumber production is about 18 per cent below normal.

Electrical jobbers report business good with the Christmas trade holding the center of the stage. However, porcelain, wiring supplies and other electrical goods which go into residence construction are selling very well. Portland jobbers report the demand for hollow ware better than last year. There seems to be a slight tendency on the part of retailers to let the jobbers carry their holiday stocks, although this tendency is not marked. Contractor-dealers report business good, but holiday business is not so active as it should be and it is not probable that it will equal that of last year. Spokane has just staged its first electrical show, which was attended by fully 15,000 persons. The educational results in the use and possibilities of electrical appliances and equipment, it is felt, will more than justify the expense of staging the exhibit. Jobbers' stocks in Spokane are good, with the exception of high-tension insulators.

Lamps.—The demand for lamps continues to be very active. The 40, 50, 75 and 100-watt sizes in "Mazda B" and "Mazda C" lamps move in greatest volume, although there is a marked tendency toward greater use of bowl-frosted lamps in than in the past.

Heaters.—This class of goods has been quite active for the past two months and continues to move well. The small reflector type heaters are the most popular. Heaters rated at from 1 kw. to 5 kw. are very active sellers in Tacoma where the house-heating customers have doubled in number each year for the past three years on account of the very low rate offered to this class of load. Portland reports stocks of single-coil radiant heaters almost depleted.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Allis-Chalmers Business Better in October and November

An encouraging increase in both October and November business has been announced by the Allis-Chalmers Manufacturing Company, and from present indications the current month will be equally good. Incoming business in the two months past exceeded billings for the first time in months, the corner apparently having been turned in November. October bookings of new business were approximately $200,000 in advance of billings, which were $1,520,000. November bookings equaled those of the preceding month.

Mueller Company Disposes of Sales Agencies

The growth of the manufacturing end of the Mueller Electric Company, Cleveland, makers of battery clips and other attachments, has been so rapid, according to the announcement of the company, that it has been necessary to dispose of several manufacturer's agencies and devote all the attention to manufacturing. The companies represented included the Philadelphia Insulated Wire Company, the Anchor Webbing Company and the Scranton Button Company. The good will of this department of the company was turned over to J. E. Black, a former employee, the new arrangement going into effect on December 1.

Chicago Pneumatic Announces Improvement

The Chicago Pneumatic Tool Company, Chicago, has announced that November sales were the best of any month this year and that December is expected to be still better. Sales are now running between 35 per cent and 40 per cent of normal. Business is dependent to a large extent on railroad and equipment shop buying. The manufacturers have been buying in good quantities lately, but the railroads have been slow. Although the roads are in need of tools, they have not the money to buy them.

Confidence Growing in Loom Market

"Facing 1922 business, I believe that the outlook is far better for loom sales than it was a year ago," said D. H. Murphy, president American Wiremold Company, Hartford, Conn., last week to a representative of the ELECTRICAL WORLD. Mr. Murphy holds that the "housecleaning" period of this branch of the industry is practically over, and that while present orders are chiefly for current requirements owing to the disinclination of jobbers to purchase to any marked extent for stock, a better feeling is evident throughout the trade. Stocks, he stated, are now well liquidated by manufacturers, jobbers and contractors. Repair work absorbs a good deal of non-metallic flexible conduit from month to month, and even a slight increase in purchases for stock would help the situation materially. Mr. Murphy said that his own company anticipates an improvement in demand soon after the inventory period is over.

Mutual Electric Now Making Safety Switches

The Mutual Electric & Machine Company, Detroit, manufacturer of open-knife switches and other electrical products, will soon place on the market a line of safety-type switches, an entirely new product for the company. They will be sold under the trade name of "Bulldog" switches.

Walla Walla Company's Receivership Ended

The Electric Equipment Company, Walla Walla, Wash., which has been in the hands of B. E. McCain of the Western Electric Company as receiver, has been purchased by A. W. Morey and A. H. Cash, who have been identified with the old company for some time.

G. E. to Pay Supplementary Compensation

The General Electric Company has announced that the 5 per cent supplementary compensation for employees in the service of the company for five years or more would be paid for six months ending Dec. 31, 1921. The 5 per cent supplementary compensation for six months ending June 30, 1921, amounted to $1,067,899 and benefited 24,773 employees.

U. S. Light & Heat Not Involved in Willys Receivership

A statement has just been issued by the U. S. Light & Heat Corporation, Niagara Falls, maufacturer of farm light plants and other apparatus, that the company is not affected by the recent receivership of the Willys Corporation. The statement has been issued, according to C. O. Miniger, president of the company, because of an impression that the company is one of the component parts of the Willys Corporation, this idea having been strengthened by the appointment of Mr. Miniger as receiver of the bankrupt company. The statement declares that the only connection betwen the two companies is that of preferred-stock ownership by the Willys Corporation in the U. S. Light & Heat Corporation, and the latter company will continue to operate as before. Mr. Miniger is also president of the Electric Auto Lite Company, one of the divisions of the Willys Corporation.

Sieben Company Gets Production Under Way

The Sieben Manufacturing Company, Kansas City, Mo., is now in its new location at 914 Genesee Street, Kansas City, and production of its Sieben "All-in-One" electric washing machine, drier and ironer has been started. The new building is three stories high and has ample room for manufacturing, assembling and storing. Henry Sieben is president of the company, and H. F. Walker is sales and advertising manager. The general offices are in the Gumbel Building, Kansas City.

Sees Approaching Business Revival in More Advertising

The infallible sign of a business revival, more advertising, is at hand, according to the *Electrical Trade*, the house organ of the Electric Appliance Company, Chicago. There has been a drop in business, the publication states, and finances have been poor, but within the last month there has been displayed a sure sign of better times.

"We refer to the condition of the paper business," the article continues. "For the past twenty years it has been found that when the demand for paper increases the whole trend of business receives a decided upward trend within three months. Today we understand that the large paper corporations are selling more of their products than they have at any time in the past year. What does this mean?

"Simply this—that the industries are starting to spend money for advertising—that they are ready to go ahead with a drive for better business—that the present condition is not a 'castle in the air' sort of optimism, but that a concrete proof of a revival of business is at hand. Advertising should show its effect to some degree at least in three months. Good effects mean good business."

Foreign Installation Contracts Announced

Some interesting large foreign orders for American electrical equipment have been announced during the past two weeks. They include a Spanish railroad electrification project and units for plants in South America, Japan and Mexico.

The contract for the electrification of 40 miles of the Spanish Northern Railway was obtained by the International General Electric Company and its associated company, the Sociedad Iberica de Constructiones Electricas. This initial order covers the most recent and one of the largest European railway electrification projects now under development. The high-voltage, direct-current system will be employed. The equipment will consist of six 78-metric-ton, six-motor locomotives, two complete substations, each comprising two 1,500-kw., three-unit motor generator sets, transformers and switchgear and the material necessary for line construction. The project comprises about 40 miles of the Leon-Gijon branch of the railway, running through the mountains between Ujo and Busdongo. The traffic is very heavy and the grades are heavy. The locomotives are to be of the freight type and will be arranged for regenerative braking. They will operate at 3,000 volts. The order is said to involve over $1,000,000.

Orders for plant equipment include one received by the Westinghouse Electric International Company through its Japanese agents, Takata & Company, from the Daido Denrioku K. K. (the Daido Electric Power Company), Japan, for electrical apparatus for two large hydro-electric plants. The total value of this order is about $2,000,000. These plants are to form a part of a "super-power" system for the Tokio district. The current for the Japanese system is to be transmitted at 154,000 volts. This is the second large order that this company has received from Japan within the last few weeks, the other being for switching equipment for the Tokio Electric Company and amounting to approximately $1,000,000.

Two other important plant equipment contracts have been closed by the International General Electric Company. The larger of the two, for both of which German interests were bidding, is for the new Tepexic development for the Mexican Light & Power Company. This project calls for 55,000 additional horsepower, using two 14,400-kw. generators. The other contract is for an additional 7,000-kw. steam-turbine unit for Montevideo. In connection with this order bids were advertised and rejected three times over a period of six months, resulting in the final award to the International General Electric Company. German prices on this installation were about 30 per cent lower than the American quotations, but German delivery was long and uncertain. This fact largely influenced the awarding of the contract.

Apex Branch to Have Own Building

A two-story-and-basement building, 50 ft. x 115 ft., to cost about $60,000, is to be erected for the Kansas City branch of the Apex Electrical Distributing Company. The branch has had a phenomenal growth, having been started less than two years ago in a small second-floor location. At that time the force consisted of a stenographer and twenty field men. It has now been enlarged to fifty office employees and 600 field men. The new building will be at 1405-07 Walnut Street.

Chapman Valve Resumes Full Time

The Chapman Valve Manufacturing Company, Springfield, Mass., announces that its plant there has resumed full-time working operations. The full working force numbers between 700 and 800 men. The step is ascribed to better business conditions. Until lately the plant operated on a basis of five days a week.

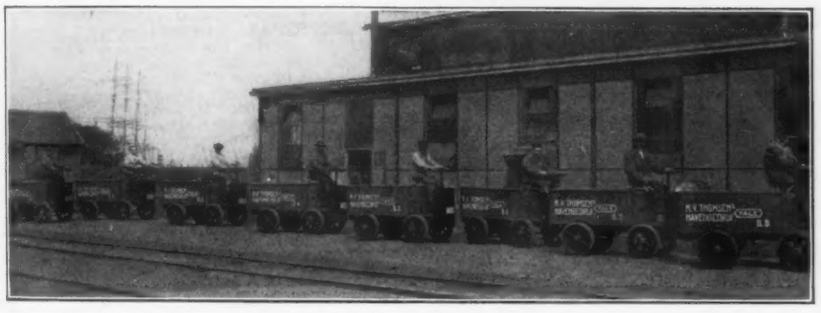
Empire Company Acquires "Elektro" Rights

Rights to the manufacture and sales of "Elektro" appliances have been secured by the Empire Transformer Company, Chicago. This includes flat-irons, percolators, toasters and a toy range. Some changes have been made in these products by the Empire company and production has already been started. According to William Seckinger, vice-president of the company, each product has to pass an engineer's test before it is allowed to be put on the market.

"Yale" Electric Tractors Win Over Foreign Competitors

An installation of eight "Yale" electric industrial tractors, each with a haulage capacity of 20,000 lb. to 30,000 lb. in trailer units, has been made at Rotterdam, Holland, in the face of sharp competition by European manufacturers.

The installation, for N. V. Thomsen's Havenbedruf, is used for pier service, and it is noteworthy that each tractor with trailer equipment replaces seven men. James C. Morgan, manager material handling equipment sales, Yale & Towne Manufacturing Company, Stamford, Conn., recently informed a representative of the ELECTRICAL WORLD that this fleet of electric industrial tractors is expected to pay for itself inside of a year, owing largely to the decrease in turn-around time effected in the case of vessels subject to wharfage expenses. It is interesting to American manufacturers that although German quotations on this fleet were about 50 per cent of those made by the successful bidder, the contract was awarded to the American producer on the basis of demonstrated quality of equipment.



AMERICAN TRACTOR FLEET RECENTLY INSTALLED AT HOLLAND SEAPORT

New Company to Manufacture Insulating Materials

The L. Robinson Corporation, with headquarters at 8-10 Bridge Street, New York City, has been formed to manufacture insulating materials. The main laboratories of the company will be maintained in New York, while factories will be located in Newark, N. J., and in St. Louis. Arrangements have been made for representation in Canada.

The company will be headed by L. Robinson. Mr. Robinson has had a long experience in the production and marketing of insulating materials, having been in charge of the insulating department of the Standard Varnish Works for the past fifteen years. Before that he was connected with various electric railway companies in the United States, Canada and France. W. D. Crumpton is vice-president and treasurer of the new organization. For the last fourteen years he has been purchasing agent and storekeeper of the British Westinghouse Electric & Manufacturing Company, Ltd. Before that he was connected with the bureau of purchases of the parent company.

The Dry-Kold Refrigerator Company, Niles, Mich., manufacturer of electric refrigerators, is erecting an addition to its plant, which will increase the floor space of the machine department by 2,000 ft.

The U. S. Ball Bearing Manufacturing Company, 4535 Palmer Street, Chicago, is adding a one-story brick forge shop to its present plant which will be used for manufacturing ball-bearing rings.

The Blaw-Knox Company, Pittsburgh, Pa., manufacturer of steel transmission towers, has announced the removal of its New York office from the City Investing Building to the Carbide and Carbon Building, Forty-second Street and Madison Avenue.

The Carter Electric Company, Kokomo, Ind., wholesale and retail dealer in electrical supplies, is erecting a new two-story building to house its retail, wholesale and motor-winding departments.

The Metropolitan Electric Appliance Company, 246 Third Avenue, New York City, electrical jobber, has changed its name to the Metropolitan Electrical Distributors.

The Packard Electric Company, Warren, Ohio, has appointed White & Converse, Metropolitan Life Building, St. Paul, sales engineers, as its representatives for that territory.

The Paramount Electric Supply & Fixture Company, Philadelphia, electrical supply jobber, has acquired the entire building at 251 Market Street, where it will carry a full line of electrical supplies, fixtures and appliances. The company is prepared to supply the stores, small jobbers and electrical contractors.

The Lewis Electric Company, Minerva, Ohio, is erecting a new plant, consisting of a main building, 62 ft. x 162 ft., two stories; a one-story building, 20 ft. x 40 ft., and a power plant, 20 ft. x 25 ft. J. C. Lewis is president of the company.

The Bestove Appliance Company, Seattle, Wash., has recently filed articles of incorporation for the purpose of engaging in the manufacture and sale of various electrical appliances on patents issued to William Barker. J. A. Dougan, New York Block, Seattle, is president of the company.

The Automatic Electrical Machine Company of San Francisco has recently perfected a line of automatic time clocks, dating machines and automatic canceling machines and is preparing to erect a factory in Oakland, Cal., for the manufacture of its products. H. G. Lundgren is the inventor of the devices and president of the company.

The Baker-Joslyn Company, manufacturer's agent on the Pacific Coast, has recently purchased the office and warehouse building of the Northwest Trading Company, Seattle, as a permanent home for its Pacific Northwest business. The building is a one-story-and-basement structure, 60 ft. x 100 ft., and is built for both warehouse and office purposes.

Foreign Trade Notes

THE VICTORIA ELECTRICITY COMMISSION RECOMMENDS THE PURCHASE OF COAL BRIQUETTING PLANT FROM GERMAN COMPANY.—The Victoria Electricity Commission, according to *Electrical Industries*, is reported to have recommended the purchase of a coal briquetting plant from the Zeitz Company of Halle, Germany. The chairman explains that after exhaustive inquiries extending over many months it was found that only in Germany could the special knowledge and efficient machinery required be found. An initial plant capable of turning out 96,000 tons of brown-coal briquettes will be installed, for which the Zeitz Company will supply special parts which are to act as models, at a cost of £86,000. The cost of the plant is estimated at £350,000, and subsequent expansions are expected to increase this amount to £750,000. The commission will also acquire boilers, buildings, electric plant and other material, the cost of which is estimated at £264,000.

AMALGAMATION OF ELECTRIC COMPANIES IN JAPAN.—During the past year, according to *Electrical Industries*, a large number of amalgamations of electric companies have taken place in Japan. The Minister of Communications is said to be in favor of a proposal for bringing under one management all the electric companies in Japan. As a preliminary step a great many minor mergers of companies operating in different districts have already taken place. The following amalgamations were mentioned in a recent article in the *Japan Times:* The Associated Electric Power Company, capitalized at 100,000,000 yen, is composed of three leading companies and will absorb three more, thus giving it control of central Japan. The Tokio Electric Company is planning to acquire four or five more companies and will increase its capital to nearly 200,000,000 yen. In the Hokkaido the Fuji Electric Company has absorbed five other companies. An amalgamation of all the large and small companies operating in Kynshiu is under consideration.

IMPORTATION OF ELECTRICAL MACHINERY IN JAPAN.—The importation of electrical machinery in Japan, in spite of increase in production, continues to grow, according to *Electrical Industries*, and it is probable that the more her industries develop the more machinery will be required from abroad, as it will be a long time before production will meet all requirements. In 1914 Great Britain supplied about 50 per cent of the machinery and Germany and the United States most of the rest. The water-turbine machinery for the various plants delivered and on order since January, 1920, up to the end of June, 1921, totals 260,000 hp. in machinery ordered abroad and 150,000 hp. in machinery made in Japan. In addition to this, another 250,000 hp. will be ordered during this year, including the 190,000-hp. plant of the Formosan Hydro-Electric Company, a project which is of a semi-government nature and which will supply power to the whole of Formosa.

ELECTRICAL CONSTRUCTION IN JAPAN.—According to reports from the American consulate at Nagoya, Japan, the Japanese electrical companies are actively pushing both hydro-electric and electric railway construction. The Nippon Electric Power Company, Ltd., the consul states, has been supplied with energy by the Ibigawa Company (the new water-power company supplying Osaka) since June 24, starting with 5,000 kw., this to be increased to 19,000 kw. during the year. The principal transmission line will pass Seto, Kosaka, Kuno, Mase, Kawataka and Itogawa. It is planned to increase the supply so that 40,000 kw. will be available for transmission in 1923, 75,000 kw. in 1924, 100,000 kw. in 1925 and 105,000 kw. in 1926. In the electric railway field the Aichi Electric Railway Company of Nagoya has been granted rights for an extension of its line to Okazaki, and it is expected that construction work will begin soon. This company has also applied for permission to construct two other lines, one of more than 10 miles branching from Ota, on the present Tokoname line, to Handa, and another 3 miles long from Tokoname to Handa via Narawa. Official sanction has been given for the construction of a railway between Oi and Tsukechi in Gifu Prefecture. A company has been organized with a capital stock of 2,000,000 yen ($997,000) to carry out the construction and operation of this line. Fifty per cent of its stock has been taken by the Daido Electric Power Company. A franchise has been granted to the Nagoya Tetsudo Kabushiki Kaisha (Nagoya Railway Company, Ltd.), a newly organized company, capitalized at 12,000,000 yen ($5,982,000), which is to take over the suburban lines of the Nagoya Electric Railway Company. The directors of the new company, it is reported, are all members of the Nagoya Electric Railway Company directorate, and it is understood that the above action is preliminary to municipal ownership of the Nagoya street railway, a matter which has been pending many months.

BRITISH ELECTRICAL STANDARDS IN SOUTH AFRICA.—The South African branch of the British Engineering Standards Association, according to the *South African Mining and Engineering Journal* of Oct. 8, has issued a copy of the "British Standard Electrical Pressures for New Systems of Installations," as published by the British Engineering Standard Association. These standards, as well as the frequency of 50 cycles per second for all alternating-current systems, have been recommended for adoption by the electrical section of the South African branch of the association.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A merchant in India (No. 405) desires to secure an agency for the sale of electrical appliances, such as lamps, wires, switches, lamp holders, etc.

A firm of importers in Sweden (No. 408) desires to secure the representation of manufacturers or wholesalers of electrolytic copper wire, metal goods, etc.

A merchant in Italy (No. 412) desires to purchase or secure an agency for the sale of electrical supplies.

The agency and purchase is desired by a mercantile firm in Norway (No. 416) of electrical apparatus and supplies, electrical household utensils, cables, wire, etc.

A mining company in Wales (No. 421) desires to purchase electrical equipment for its works, with a view of substituting electricity for steam and to replace obsolete machinery.

ELECTRIC EQUIPMENT FOR THE PROPOSED WAIKATO (NEW ZEALAND) POWER SCHEME.—Bids will be received by the Public Works Department of New Zealand, addressed to the Secretary Public Works Tender Board, Wellington, New Zealand, until March, 1922, according to the *Electrical Times*, for two 2,500-kva., three-phase, 50-cycle alternators, two 3,100-hp. water turbines (Francis type), and two exciter sets, each consisting of one 200-kw., direct-current generator and one 350-hp. synchronous motor, together with a Tirrill regulator.

New Apparatus and Publications

ADJUSTABLE LAMPS.—S. Robert Schwartz & Brother, 729 Broadway, are distributing catalog No. 19, describing the "Esrobert" adjustable desk portables and floor lamps.

MOTOR-GENERATOR SETS.—The Ideal Electric & Manufacturing Company, Mansfield, Ohio, is distributing bulletin 106, covering its different types of "Ideal" motor-generator sets.

ELECTROPLATING APPARATUS.—Bulletin 107 issued by the Ideal Electric & Manufacturing Company, Mansfield, Ohio, describes its different types of motor-driven electro-plater sets.

BRASS TUBING.—"Tube Facts" is the title of a booklet published by the Scovill Manufacturing Company, Waterbury, Conn., in which it gives scientific data regarding the brasses and other metals used in the production of seamless tubing and also describes and illustrates the different processes involved in the manufacture of tubing.

HEATER.—An electric heater for heating rooms and keeping food and drinks warm has been placed on the market by the Overland Electric Company, 4236 Ogden Avenue, Chicago.

RANGE.—The H. G. Weeks Manufacturing Company, Hamilton, Ohio, has brought out an electric range with an oven, broiler-toaster and two surface burners.

BATTERY AND JAR HOLDER.—A device for holding batteries and jars while removing elements has been placed on the market by the Service Station Supply Company, 30-32 East Larned Street, Detroit, under the name of the "Hydrate" battery and jar gripper.

LIGHTING PLANT.—The Simplex Utilities Corporation, 360 Madison Avenue, New York City, is marketing an electric light and power plant of 1½ kw. capacity.

KITCHEN APPLIANCE.—The Play-O-Lite Company, Front and Warren Streets, Worcester, Mass., is marketing a kitchen appliance, "Moto-Maid," for beating eggs, grinding knives, etc.

TOY TRANSFORMERS.—Sperry & Bittner, 422 First Avenue, Pittsburgh, manufacturers' representatives (electrical), has placed on the market a toy and bell ringing transformer, under the name of "Little Bill."

AIR CONDENSER.—The General Radio Company, Massachusetts Avenue and Windsor Street, Cambridge 39, Mass., manufacturer of radio and electrical laboratory apparatus, has recently brought out a new variable air condenser.

WHITE CEDAR POLES.—The Northern White Cedar Association, Lumber Exchange, Minneapolis, is distributing a booklet covering its Northern white cedar poles.

RED CEDAR POLES.—"The Story of Pentrex" is the title of a booklet published by the Western Red Cedar Association, Peyton Building, Spokane, Wash., describing a new method of butt treating of the "Pentrex" poles.

CLEANING SOLUTION.—The Oakley Chemical Company, 22 Thames Street, New York City, is distributing a small booklet entitled "Oakite" for Cleaning Waste and Wiping Cloths in machine shop, metal-working factories, power houses, etc.

THAWING SET.—The Auto Engine Works, University Avenue and Griggs Street, St. Paul, has developed a gasoelectric thawing ("Capital") set for thawing frozen underground pipes.

ELECTRICAL ACCESSORIES.—"Electrical Accessories for Laboratory and Commercial Use" is the title of bulletin No. 18 distributed by the Standard Scientific Company, corner West Fourth and Barrow Streets, New York City, covering its carbon compression rheostats, direct-current meter-loading units, thumbar terminals, binding posts and connectors, etc.

PORTABLE LAMP.—The Waterbury Metal Wares Company, Waterbury, Conn., has placed on the market an adjustable lamp, known as "Practi-Lite."

—New Incorporations

New Companies

THE SANDBERG-SHEPPARD COMPANY, Worcester, Mass., has been incorporated by Herbert V. Sheppard, Charles E. Sandberg, Gustaf Erickson and James E. Sheppard. The company is capitalized at $100,000 and proposes to manufacture electrical appliances.

THE COLUMBUS ELECTRICAL SUPPLY COMPANY, New York, N. Y., has been incorporated with a capital stock of $20,000 by H. and M. Ferber, and S. W. Levine, 261 Broadway. The company proposes to manufacture and deal in electrical equipment.

THE MURRAY-GARR ELECTRIC STALL STARTING COMPANY, Wilmington, Del., has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $100,000 to manufacture electrical equipment. The company is represented by the Delaware Charter Company, 904 Market Street, Wilmington.

THE McINTOSH ELECTRICAL CORPORATION has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $250,000 to manufacture instruments for use of electricity. T. L. Croteau, M. A. Bruce and C. H. Blaske, Wilmington, are attorneys.

THE CITIZENS' LIGHT & POWER COMPANY, Fredericksburg, Tex., has been incorporated with a capital stock of $40,000 by J. Stein, Louis Kott and Hugh Basse.

THE ELECTRIC DRAFT HEATER CORPORATION, 914 South Michigan Avenue, Chicago, Ill., has been incorporated with a capital stock of $6,000 to manufacture heating devices, etc. The incorporators are R. E. Leopold, G. W. Axelson and E. A. Zimmerman.

THE TRIAD ELECTRIC COMPANY, Boston, Mass., has been incorporated with a capital stock of $25,000 to manufacture electrical equipment. The officers of the company are Edward J. McCaffrey, president, and Aubrey S. McLeod, Bedford, Mass., treasurer.

THE LITOMETER COMPANY, INC., has been chartered under the laws of the State of Rhode Island to manufacture and deal in electrical and mechanical specialties. The incorporators are Justin Henderson, Benjamin T. Tregoe and E. Wojan. Headquarters will be maintained in Providence.

Record of Electrical Patents

Notes on United States Patents

(Issued Nov. 15, 1921.)

1,397,239. ELECTROLYTIC PRODUCTION OF HYPOCHLORITE SOLUTIONS; Henry B. Slater, Riverside, Cal. App. filed Nov. 9, 1920.

1,397,247. STORAGE-BATTERY-TESTING INSTRUMENT; John W. FitzGerald, Detroit, Mich. App. filed March 26, 1920. Electrical meter to record condition of charge.

1,397,249. HOUSEHOLD ARTICLE; Peter F. Glenn, Philadelphia, Pa. App. filed March 3, 1920. Portable rotating device for polishing, sharpening knives, etc.

1,397,276. PROTECTIVE DEVICE; Henry G. French, Schenectady, N. Y. App. filed Oct. 24, 1919. Relay of induction type.

1,397,278. SPEED-REGULATING APPARATUS; Valere A. Fynn, St. Louis, Mo. App. filed July 5, 1919. Electromagnetically governing speed of prime movers.

1,397,298. STATIONARY INDUCTION APPARATUS; John A. Seede, Schenectady, N. Y. App. filed Feb. 15, 1921. Welding transformer.

1,397,353. ELECTRIC DRIVE FOR VEHICLES; Fred Berger, New York, N. Y. App. filed Dec. 21, 1920. Gasoline motor drives generator which supplies main driving motor.

1,397,361. PRESSURE VARIABLE RESISTANCE; Alexander Churchward, New York, N. Y. App. filed May 7, 1920. Well-cooled carbon pile.

1,397,363. INSULATING END PLATE; Lovell B. Cole, St. Louis, Mo. App. filed Dec. 4, 1920. To protect windings at edge of slot.

1,397,396. PLANER AND SYSTEM OF MOTOR CONTROL THEREFOR; Harold L. Blood, Plainfield, N. J. App. filed Jan. 7, 1918.

1,397,421. ELECTRIC SIGNAL; Richard M. Hopkins, Rutherford, N. J. App. filed Oct. 25, 1918. Operated by comparatively weak current.

1,397,432. SIGNALING SYSTEM; Charles V. Logwood, New York, N. Y. App. filed June 16, 1917. Wireless.

1,397,441. ELECTRICAL MEASURING INSTRUMENT; Carl D. Miller, Rockville, Mass. App. filed April 5, 1919. Static voltmeter.

1,397,449. ELECTRICALLY OPERATING MECHANISM FROM A DISTANCE; Alexander Parshin, London, England. App. filed Nov. 20, 1918. Suppressing sparking.

(Issued Nov. 22, 1921)

1,397,514. PROCESS FOR DEPOSITING A METALLIC COATING ON VARIOUS METAL ARTICLES OR OBJECTS; Frederick W. Haines, township of Sandwich East, Ontario, Can. App. filed Sept. 28, 1918.

1,397,562. OXIDATION AND REDUCTION PROCESS AND APPARATUS THEREFOR; Charles J. Thatcher, New York, N. Y. App. filed Jan. 24, 1920. For electrolytically oxidizing substances such as anthracene.

1,397,575. SELECTIVE AUDION AMPLIFIER; Lee de Forest, New York, N. Y. App. filed April 9, 1915 Will amplify high-frequency currents more than low frequency currents.

1,397,576. TELEGRAPHY; Thomas B. Dixon, New York, N. Y. App. filed Nov. 1, 1917. Imperfect balance between main and artificial lines neutralized.

1,397,582. ELECTRIC SIGNAL; Edgar W. Hazazer, New York, N. Y. App. filed July 14, 1916. Vibrating-diaphragm horn.

1,397,610. COMBINED CIGARETTE OR LIKE CASE AND ELECTRIC TORCH; Samuel A. Appell, New Haven, Conn. App. filed Feb. 25, 1920.

1,397,620. MULTIPLE-URN CONSTRUCTION; Warren F. Clark, Cleveland, Ohio. App. filed Dec. 24, 1919. Single source for heating.

1,397,633. REEL FOR ELECTRIC-WIRE CONNECTIONS; Alva L. Hite, Pomeroy, Ohio. App. filed May 23, 1919. Self-reeling for extension cords.

1,397,641. MEANS FOR DETECTING CHANGES OF RESISTANCE IN ELECTRIC CIRCUITS; Petrus Van Santen Kolff, Philadelphia, Pa. App. filed Dec. 9, 1916.

1,397,646. BATTERY HANDLAMP; Lorenz Maisel, Madison, Wis. App. filed May 11, 1920. Lamp protected from shock.

1,397,647. PROCESS OF ELECTROLYSIS OF COPPER-BEARING SOLUTIONS; Percy R. Middleton, Los Angeles, Cal. App. filed Feb. 16, 1920.

1,397,687. TRANSMITTER AND CIRCUITS THEREFOR; Newman H. Holland, West Orange, N. J. App. filed Sept. 26, 1917. Microphone transmitters.

1,397,694. MEANS FOR CONTROLLING TEMPERATURES; Tiodolf Lidberg, Chicago, Ill. App. filed May 21, 1919. For bateriological work.

1,397,705. PORTABLE ELECTRIC LAMP; Louis E. Shaw, East Orange, N. J. App. filed Jan. 17, 1918. For field service.

1,397,735. PROCESS OF RECOVERING COAL, HELD IN SUSPENSION, FROM COAL-BEARING WATER AND STREAMS; Charles E. Holland, Brooklyn, N. Y. App. filed Nov. 13, 1920. Particles precipitated by electrolytic action.

1,397,766. CONSTANT-TEMPERATURE WATER BATH; Tiodolf Lidberg, Chicago, Ill. App. filed Feb. 23, 1918. For therapeutic purposes.

1,397,785. ELECTROTYPE MATERIAL AND METHOD OF FORMING SAME; George U. Rose, Jr., Washington, D. C. App. filed March 2, 1921. Electro-depositing process of forming printing plates.

1,397,799. ELECTROLYTIC CELL; Elisha B. Cutten, Minneapolis, Minn. App. filed June 25, 1920. Decomposition of sodium chloride solution.

1,397,862. TRANSMISSION SYSTEM; Albert L. Fitch, East Orange, N. J. App. filed Nov. 26, 1917. For connecting transmitter to electron-discharge device.

1,397,872. ELECTRIC HEATER; Joseph Lavoie, Montreal, Quebec, Cann. App. filed Nov. 26, 1919. Readily converted from room warmer to cooker.

1,397,888. BELL-RINGER RESISTANCE UNIT; Jacob Chodrow, Buffalo, N. Y. App. filed Feb. 4, 1921. Connected in series with service lines and a doorbell.

1,397,975. ELECTRICAL TESTING SYSTEM; George W. Kuhn, Brooklyn, N. Y. App. filed Feb. 19, 1920. For telephone toll office.

1,397,991. MESSAGE-REGISTERING SYSTEM; George K. Thompson, Maplewood, N. J. App. filed Oct. 9, 1919. Registering device locked in circuit by subscriber.

1,398,005. TROLLEY-WIRE PROTECTOR; Francesco Colabrese, Albert, W. Va. App. filed March 12, 1920. For preventing workmen from touching wires.

1,398,006. PRODUCTION OF ZINC; Cornelius E. Cornelius, Stockholm, Sweden. App. filed March 17, 1921. Continuous process.

1,398,028. PROCESS AND APPARATUS FOR WORKING METALS; Frank P. Kobert, Amityville, N. Y. App. filed Sept. 29, 1917. Heating, reheating, riveting and welding.

1,398,029. TELEPHONE ATTACHMENT; John P. Lee, Pleasantville, N. Y. App. filed April 20, 1921. To prevent conversation from being overheard.

1,398,032. INCANDESCENT LAMP AND METHOD OF MAKING THE SAME; Oscar V. Maurer, East Cleveland, Ohio. App. filed March 10, 1919. Tipless incandescent lamp.

1,398,033. METHOD OF MAKING INCANDESCENT LAMPS; Oscar V. Maurer, East Cleveland, Ohio. App. April 23, 1919. For flashlights.

1,398,051. PROCESS FOR THE MAGNETIC SEPARATION OF ORES; Clarence Thom, Ralph W. Diamond and Selwyn G. Blaylock, Trail, B. C. App. filed April 30, 1920. Four consecutive steps.

1,398,056. SYSTEM AND APPARATUS FOR CONTROLLING MOTORS; Albert K. Allison, Tappan, N. Y. App. filed Oct. 6, 1920. Movements of motor definitely controlled.

1,398,058. PORTABLE ELECTRIC PLANT; Edward L. Aurand, Detroit, Mich. App. filed May 1, 1918. For use in isolated homes.

1,398,065. METHOD OF PREPARING STORAGE-BATTERY SEPARATORS; Campbell C. Carpenter, Niagara Falls, N. Y. App. filed Feb. 14, 1921. Removing harmful constituents from wood.

1,398,077. SWIVEL ATTACHMENT PLUG; Philip S. McLean, Bloomfield, N. J. App. filed April 25, 1917.

1,398,167. ELECTRIC HEATER; Johan R. Bakstad, Chicago, Ill. App. filed Oct. 7, 1920. For heating railway cars.

1,398,192. ELECTRODE FOR ANNEALING AND HEATING SYSTEMS; Watson Hurlburt, Chicago, Ill. App. filed Feb. 24, 1919. Evenly distributed heat.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

SOUTH WINDHAM, ME.—The Windham Manufacturing Company is having plans prepared for the construction of a hydro-electric power plant. Arthur P. Safford, 66 Broadway, Lowell, Mass., is engineer.

WILLIMANSETT, MASS.—The Hampden Motor Truck Company, Holyoke, recently organized, is planning the construction of a power house in connection with its new plant at Willimansett. R. D. Bloom is president.

BURRVILLE, CONN.—The Connecticut Power Company, New London, is contemplating changes at its Burrville generating plant, in connection with proposed plans to purchase electrical energy from the Winstead (Conn.) Gas Company for the operation of the Torrington-Winchester trolley lines of the Connecticut company.

NEW HAVEN, CONN.—The New York, New Haven & Hartford Railroad Company, it is understood, is considering the construction of a large power plant near its yards at Cedar Hill. Edward J. Pearson, New Haven, is president.

WINDSOR, CONN.—Plans are being prepared by the Farmington River Power Company, New Britain, for the construction of a new hydro-electric power plant to have an initial capacity of about 12,000 hp. I. W. Jones, Milton, N. H., is engineer.

Middle Atlantic States

EAST GREENBUSH, N. Y.—The Hamilton Industrial Corporation, Hamilton Street, Albany, is planning the construction of a one-story power house at its new factory, 50 ft. x 240 ft., at East Greenbush.

VESTAL, N. Y.—The Binghamton Light, Heat & Power Company has geen granted a franchise to furnish electricity in Vestal.

WILLARD, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until Dec. 21, for construction, including heating, sanitary and electric work, in connection with additional accommodations at the Willard State Hospital.

EGG HARBOR, N. J.—Plans are under consideration by the Ingram Motor Company, 2 Rector Street, New York City, for the construction of a one-story power house in connection with its proposed automobile manufacturing plant at Norfolk and Atlantic Avenues, Egg Harbor. Joseph A. Ingram is president.

GLASSBORO, N. J.—The Board of Education, Trenton, has plans under consideration for the construction of a one-story power house in connection with the three-story State Norman School, 138 ft. x 300 ft., on Mullican Hill Road, Glassboro. Guilbert & Betelle, 665 Broad Street, Newark, are architects.

JERSEY CITY, N. J.—The Weehawken (N. J.) Dry Dock Company, foot of Baldwin Street, is considering the construction of a shipbuilding and repair plant and a power house in the South Cove district, near Henderson Street, Jersey City. The cost is estimated at $300,000.

LINDEN, N. J. — The Warner-Quinlan Company, 79 Wall Street, New York City, is having plans prepared for the reconstruction of its works and power plant in Linden, recently destroyed by fire. The loss is estimated at $2,000,000. George Gifford, 227 Fulton Street, New York City, is engineer.

CONFLUENCE, PA.—The Hagerstown & Frederick Railway Company, Hagerstown, Md., is considering the construction of a 40,000-kw. power plant at Confluence, Pa. Surveys have been made for the erection of a transmission line to connect the proposed unit with its present system.

PHILADELPHIA, PA.—The Board of Education has decided to substitute electric lamps for the gas lamps now in use in the local schools. The sum of $100,000 has been appropriated for the work.

PHILADELPHIA, PA.—Plans have been filed by the A. Theodore Abbott Company, Berkley Avenue, for the construction of a

power house in connection with its upholstery goods manufacturing plant, now under construction at Twenty-third Street and Allegheny Avenue. W. E. S. Dyer, Land Title Building, is engineer.

WASHINGTON, PA.—Plans have been prepared by the Tyler Pipe & Tube Company for the construction of a one-story power house, 25 ft. x 50 ft., and a producer plant, 50 ft. x 50 ft., to cost, including machinery, about $50,000. The Simplex Engineering Company, Washington Trust Building, is engineer.

BALTIMORE, MD.—The Canton Company, Commerce and Water Streets, is considering the construction of a one-story power house, 40 ft. x 70 ft., at Third and Sixteenth Streets.

BALTIMORE, MD.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Dec. 27 for a lighting plant for the post office at Baltimore.

HAGERSTOWN, MD. — The Board of Street Commissioners has directed A. B. Grubmeyer, superintendent of the municipal electric light plant, to prepare plans for the construction of a new light plant in the vicinity of Marsh Run.

PETERSBURG, W. VA.—The construction of a dam and hydro-electric power plant across the south branch of the Potomac River is under consideration by the Community Power Company. The company is represented by A. J. Welton.

WELLSBURG, W. VA.—The American Gas & Electric Company, 30 Church Street, New York City, is considering the establishment of a power plant in Wellsburg, W. Va. Sargent & Lundy, 72 West Adams Street, Chicago, Ill., are architects. R. E. Breed is president.

North Central States

ERIE, MICH.—The Toledo (Ohio) Edison Company contemplates the construction of a substation on its Toledo Beach line and the extension of electric transmission lines to Erie.

LANSING, MICH.—The date of bids to be received by the Board of Water and Electric Light Commissioners, Lansing, for the construction and equipment of a new municipal power plant has been extended from Dec. 15 to Jan. 10, 1922.

ALLIANCE, OHIO.—The consolidation of the Alliance Gas & Power Company, Lorain County Electric Company, Massillon Electric & Gas Company and Trumbull Public Service Company under the name of the Ohio Public Service Company, with a capital stock of $6,500,000, has been affected. The present plans of the new company provide for the construction of a large generating station along the Ohio River with high-tension interconnecting transmission lines between Warren, Ashland, Alliance and Massillon.

CALDWELL, OHIO.—At a special election to be held Dec. 23 the proposal to issue $15,000 in bonds for the installation of new machinery in the municipal electric light plant will be submitted to the voters. Twenty-four-hour service will be established.

DAYTON, OHIO.—The City Commission is considering the installation of a new ornamental lighting system, maintained by underground conduits, on West Third Street between Olive Street and the Pennsylvania Railroad. Plans are reported under way for an ornamental lighting system on East Third Street between Bell Street and Harshman Street. Street-lighting service is furnished by the Dayton Power & Light Company.

HUNTINGTON, IND.—The Bippus Utilities Company, Huntington, recently organized, has been authorized by the Indiana Public Service Commission to issue $150,000 in stocks and bonds, the proceeds to be used for taking over the electric plant of the Browne-Mills Electric Company at North Manchester and for the construction of a new plant, etc.

INDIANAPOLIS, IND. — The Indiana Electric Corporation has filed an amended petition with the Indiana Public Service Company for the consolidation of seven public utility companies, including the Merchants' Heat & Light Company of Indianapolis, the Elkhart Gas & Fuel Company and the Valparaiso Lighting Company, all of which are now owned by the corporation, and the Indiana Railways & Light Company of Kokomo, Wabash Valley Electric Company, Putnam Electric Company and Cayuga Electric Company.

WINCHESTER, IND.—The construction of a one-story power house is planned by the Storms Novelty Works, in connection with the two-story plant, 59 ft. x 100 ft., now under construction.

GRANITE CITY, ILL. — The Madison County Light & Power Company, Granite City, is having plans prepared for improvements to its transmission lines and its power plants at Venice and Edwardsville. The cost is estimated at $65,000.

SHELBYVILLE, ILL.—The construction of a municipal electric power plant, to cost about $75,000, will be held in abeyance by the Council. Bids, it is understood, will be asked next spring. Fuller & Beard, Railway Exchange Building, St. Louis, Mo., are engineers.

SPRINGFIELD, ILL.—The Illinois Power Company, recently organized, has filed a petition with the Illinois Commerce Commission for permission to take over the properties of the Springfield Consolidated Railway Company, Springfield Gas & Electric Company of Springfield and the De Kalb-Sycamore Electric Company, operating in De Kalb and Sycamore. Permission is also asked to issue $5,000,000 in bonds and $5,025,000 in stock. A. D. Mackie is vice-president and general manager of the Springfield Consolidated Railway Company.

WAUKEGAN, ILL.—The Public Service Company of Northern Illinois, Chicago, it is reported, has plans under way for the construction of a generating station at Waukegan to have an ultimate capacity of 220,000 kw. It is proposed to begin construction of the plant early next year, when the initial installation of two units of 20,000 kw. each will be made. The present plans also include the erection of transmission lines connecting the Waukegan station with the Northwestern station of the Commonwealth Edison Company of Chicago, to provide for an interchange of electrical energy in case of emergency.

EAGLE RIVER, WIS.—An issue of $20,000 in bonds has been authorized for the purchase of additional generating equipment for the municipal hydro-electric generating plant.

KANSAS CITY, MO.—The Kansas City Power & Light Company is reported to be negotiating with the city officials of Lawrence, Topeka and several other Kansas towns to furnish electricity to the distributing plants in these places.

MEXICO, MO. — The Missouri Utilities Company contemplates enlarging its plant to enable it to furnish electricity in additional territory, including Montgomery City where the electric light plant was recently destroyed by fire. The cost of the new equipment is estimated at $25,000.

ST. CHARLES, MO.—The question of installing an electric light and power plant in St. Charles, to cost about $235,700, is under consideration by the City Council. Benham & Mullergren, Firestone Building, Kansas City, Mo., are consulting engineers.

Southern States

AUGUSTA, GA.—The city officials and J. P. Wood, it is reported, are interested in the establishment of a hydro-electric plant on the canal, to generate electricity at a point about 2 miles from Augusta to operate industrial works, including cotton mills. The project provides for the development of 12,000 hp. and will cost $1,500,000.

LAKE CITY, FLA.—Bids, it is reported, will be received by the city of Lake City for the following: One poppet-valve automatic uniflow engine of approximately 300 hp. when operating at 125 lb. steam pressure, to be arranged for direct connection to a 240-kva., 2,300 volt, three-phase, 60-cycle, alternating current electric generator and to be provided with belted exciter of ample capacity and other necessary fittings. One six-panel switchboard consisting of three combined generator and exciter panels, two feeder panels and one regulator and totalizing wattmeter panel; the three generator panels are to control generators and three exciters, one of 70-kw. capacity and two of 240-kw. capacity; the two feeder panels are to be of 150-kw. capacity and 400-kw. capacity and to have watt-hour meters; each panel is to be equipped with necessary instruments, switches, wiring, busbars and supports. An automatic voltage regulator for control of generators. One jet or barometric condenser having a capacity of 6,000 lb. of exhaust steam per hour with 26-in. vacuum, complete with steam-driven air pump and motor-driven circulating pump, temperature of circulating water of 90 deg. Fahr. C. E. Hurst is city manager.

DOTHAN ALA.—Plans are under way by the Houston Power Company for the construction of a hydro-electric generating plant on the Choctawhatchee River, Dale County. The plans provide for an initial installation of 2,000 hp.

COLUMBIA, LA.—The installation of a municipal electric light plant to be operated in conjunction with a waterworks system is under consideration, for which $30,000 in bonds have been issued.

NEW ORLEANS, LA.—Bids, it is reported, are being received by the New Orleans Railway & Light Company for one 20,000-kw. turbine complete, including installation, $540,000; relaying and switching apparatus at central station, $100,000; additional switchboards, $25,000; new building for Bourbon substations, $30,000; new rotary for Edison system, $50,000; new rotary for railway system, $50,000; two 6,600-volt underground feeders, $28,000 each; one 6,600-volt tie line from Magazine to Bourbon substation, $12,000; one 6,600-volt tie line from Edison to Consumers substation, $10,000; underground ducts, $50,000; reroute half of 6,600-volt feeders to Canal and Valence substations, $25,000; extend Shrewbury feeder into Canal substation, $8,000; new feeders for distribution system and rearrangement of existing feeders, $44,000. A. Kempster is general manager of the company.

PAWHUSKA, OKLA.—Contracts, it is reported, will be awarded by the City Commissioners on Dec. 21 and 22 for extensions to the municipal electric power plant and construction of a sewage-disposal plant. New equipment, including two additional engines, will be installed. Bonds to the amount of $113,000 have been issued for power plant and $51,000 for sewage disposal plant.

CURRIE, TEX.—The Currie Light & Power Company is considering the construction of a new plant in Currie, for which a site has been acquired.

MEXIA, TEX.—The Central Texas Ice, Light, Water & Sewerage Company is contemplating the installation of new equipment at its local power house, to cost about $50,000.

SAN ANTONIO, TEX.—Bids, it is understood, will be received by the San Antonio Water Supply Company early in January for a 15,000,000-gal. steam-turbine centrifugal pumping outfit and a 5,000,000-gal. electrically driven centrifugal pumping outfit.

WELLINGTON, TEX.—The City Council has called an election for the purpose of submitting to the voters a proposal to issue $50,000 in bonds for the establishment of a municipal light and power plant.

YORKTOWN, TEX.—Local manufacturing concerns are considering the construction of an independent electric power plant. According to present plans the power plant will be erected near the Yorktown Cotton Oil & Manufacturing Company's plant.

Pacific and Mountain States

PORTLAND, ORE. — James Lindsey of Portland has filed with Percy Cupper, State Engineer, application for authority to construct two reservoirs to be known as the Marion Lake reservoir and the Santiam River Reservoir for the storage of water for power development in Linn County.

CHICO, CAL.—Arrangements have been made by the Shell Oil Company with the Pacific Gas & Electric Company, Chico, for the erection of a transmission line to the site of the proposed distributing plant of the oil company, on the Thomasson Ranch near Chico.

SAN DIEGO, CAL.—Bids will be received at the office of the Chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 28, Specification 4559, for gas, sewer, water and underground electric systems at the naval hospital, San Diego. Bids will also be received until Jan. 4, 1922, Specification 4526, for street-lighting and fire-alarm system at San Diego.

SAN LEANDRO, CAL.—Bids, it is understood, will be received by the Alameda County officials, Oakland, about Jan. 1, 1922, for a one-story laundry and one-story power house, refrigerating plant, ice plant, incinerator, shops, etc., on the County Infirmary grounds in San Leandro. H. H. Meyers, Kohl Building, San Francisco, is architect.

Canada

FULLARTON, ONT. — The township authorities are considering the installation of an electric lighting and power distribution system, to cost about $48,000. For further information address R. H. Pomeroy, Fullarton.

LONDON, ONT.—Plans are under way by the London & Port Stanley Railroad for the installation of additional power units, enlarging terminals and the construction of additional sidings. The cost is estimated at $100,000.